

*Radionuclide Concentrations in  
Soils and Vegetation at Low-Level  
Radioactive Waste Disposal Area G  
During the 1999 Growing Season*

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**J.W. Nyhan, P.R. Fresquez, R. Velasquez, and E.A. Lopez**

**ABSTRACT**

Soil samples were collected at 52 locations, and unwashed overstory and understory vegetation samples were collected at 12 locations within and around Area G, a disposal facility for low-level, radioactive solid waste at Los Alamos National Laboratory (LANL). The samples were analyzed for  $^3\text{H}$ ,  $^{238}\text{Pu}$ ,  $^{239,240}\text{Pu}$ ,  $^{90}\text{Sr}$ ,  $^{241}\text{Am}$ ,  $^{137}\text{Cs}$ , and  $^{\text{tot}}\text{U}$ , and 12 of the soil samples were analyzed for gross alpha, beta, and gamma radioactivity.

Tritium,  $^{238}\text{Pu}$ ,  $^{239,240}\text{Pu}$ , and  $^{241}\text{Am}$  concentrations in soils were above the upper 95% level of background concentrations; all, however, were less than LANL screening action levels. In contrast, most of the radionuclide concentrations in the unwashed vegetation samples were below the upper 95% level of background concentrations, except for  $^3\text{H}$ . Tritium concentrations in vegetation from most sites were greater than background concentrations of about 2 pCi mL<sup>-1</sup>.

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**I. INTRODUCTION**

Solid radioactive wastes have been disposed of by burial at Los Alamos National Laboratory (LANL) since the early 1940s (Purtymun et al., 1980). Area G is a 25.5-hectare (63-acre), low-level radioactive waste processing and disposal area located on the east end of Mesa del Buey at Technical Area 54 (Figure 1). Area G was established in 1957 and is the Laboratory's primary radioactive solid

waste burial and storage site (Soholt, 1990). Wastes for disposal include contaminated equipment, paper, plastics, clothing, building materials, soils, and process wastes and are placed in either pits, trenches, or shafts and then covered with fill material (Hansen et al., 1980). Tritium,  $^{\text{tot}}\text{U}$ ,  $^{238}\text{Pu}$ ,  $^{239,240}\text{Pu}$ , and a variety of fission and activation products are the main isotopes in waste materials deposited at Area G (U.S. DOE, 1979).

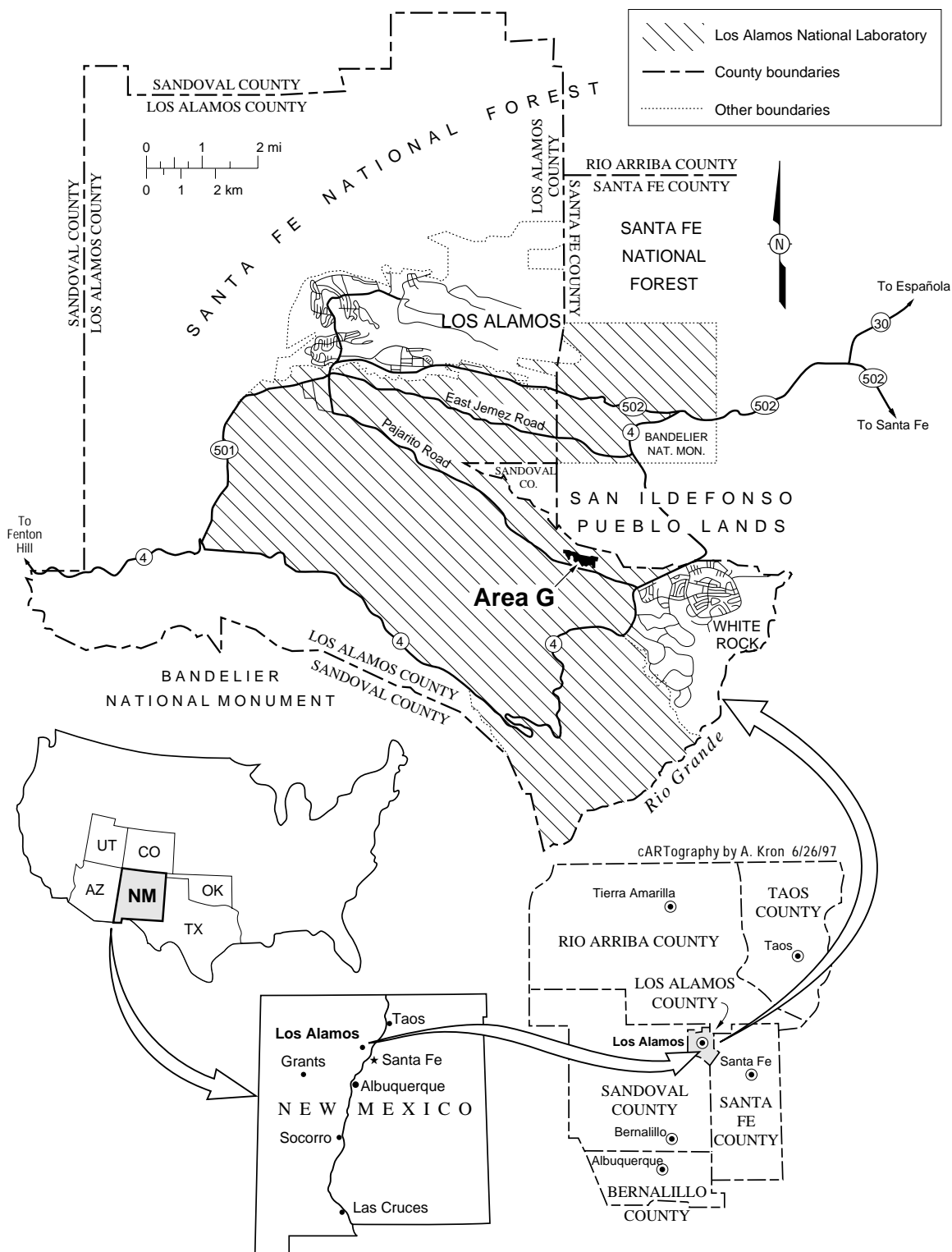


Figure 1. The location of Area G at Los Alamos National Laboratory.

As part of the Environmental Surveillance Program (ESP) at LANL, samples of air (LANL, 1998), water (Mullen et al., 1996), soils/sediments (Fresquez et al., 1996a, 1997a, 1998a, 1999; Jacobson, 1992), vegetation (Fresquez et al., 1995, 1996b, 1997b, 1998b, 1999), small mammals (Biggs et al., 1995, 1997; Bennett et al., 1996), and bees (Fresquez et al. 1997b, Haarmann and Fresquez, 1998, 1999) are collected annually from within and around radioactive waste disposal site Area G to monitor and assess the site's impact on the surrounding environment. Radionuclides in game animals such as elk and deer have also been recently assessed around Area G (Ferenbaugh et al., 1999).

Two components of the Area G surveillance program are the assessments of soil and vegetation within and around Area G for radiological contamination. The soil sampling program is the most direct means of estimating the types, concentrations, and distributions of radionuclides in the environment within and around nuclear facilities (Fresquez et al., 1998a). Soil provides an integrating medium, or reservoir, that can account

for contaminants released to the atmosphere, either directly from gaseous effluents, such as air stack emissions, or indirectly from the resuspension of on-site contamination (fugitive dust) (Healy, 1977). Subsequently, the knowledge gained from the radiological surveillance of soil is critical to provide information about potential exposure by way of several pathways that include soil ingestion, consumption of food crops, resuspension of radionuclides into the air, and contamination of groundwater. Exposure to radionuclides by these pathways may result in radiation doses to humans (Hakonson et al., 1981). The uptake of radionuclides by vegetation may also give some insight into surface (Hansen et al., 1980) and subsurface (Wenzel et al., 1987) pathways of contaminants to humans from waste disposal areas. Trees, in particular, have been shown to be excellent indicators of subterranean  $^3\text{H}$  migration from low-level radioactive waste disposal sites (Rickard and Kirby, 1987).

In the late 1970s, the Atomic Energy Commission issued interim operational criteria for radioactive waste areas owned or operated by them and

their contractors (EG&G, 1978, 1981; Dames and Moore, 1976). As a first response to the surveillance requirements listed in these criteria, personnel from the Environmental Surveillance Group at Los Alamos Scientific Laboratory developed an interim surveillance plan for the site's radioactive waste areas (Hansen et al., 1980) to supplement the Laboratory's general environmental surveillance effort. Since a portion of the original program code for this program had the designator "A411," this program became known as the A411 Program (Conrad et al., 1995). The first announcement and monitoring results of this program appeared in the 1980 and 1982 Environmental Surveillance Reports, respectively (Environmental Surveillance Group, 1981, 1983), and additional program results have been reported in the 1990s (Conrad et al., 1995, 1996; Childs and Conrad, 1997, 1998, 1999).

The A411 Program investigation focuses principally on the possibility of contaminated sediment movement through surface-water runoff out of the perimeter of Area G. Sampling locations

were intentionally selected to best indicate possible contamination moving outside the perimeter of Area G; thus, these sampling locations should be considered as those locations most sensitive to possible contaminant migration.

The objective of this annual survey was to measure the concentrations of selected radionuclides in surface soils and unwashed overstory and understory vegetation within and around Area G during the 1999 growing season. The surface soil data from this study were then compared with the surface soil data collected in the A411 Program during 1999. All of these data were compared to radionuclide concentrations in soils and vegetation collected from regional background locations. The background areas are located away from LANL, and radionuclide concentrations result from naturally occurring elements and/or from worldwide fallout.

## **II. METHODS**

In July of 1999, the Soils, Foodstuffs, and Biota Environmental Contaminant Surveillance Program

Team of LANL's Ecology group (ESH-20) collected 11 samples of surface soils and 24 vegetation samples from areas within and around Area G at TA-54 (Figure 2). In May of 1999, personnel from LANL's Hazardous and Solid Waste group collected 40 samples of surface soils at several A411 Project locations within and around Area G. Each of the latter locations contained an aluminum stake with a brass tag that was stamped with a unique site identification number identified with a "G-" prefix (Conrad et al., 1995). Table 1 lists all of these sampling locations and location descriptions that are shown on Figure 2.

Although most of the soil samples were collected outside of and adjacent to the Area G fence, several samples were also collected inside of Area G. Sample locations 3, 5, 7a, 7b, G-34-05, G-34-07, G-34-09, G-34-10, and G-34-15 are inside the Area G fence. Samples from locations 1, 2, 3b, 4, 6b, 7c, 8, and the 35 of the A411 Project samples not mentioned above were collected outside the Area G fence. Location 8 is west of Area G in the proposed expansion area. Background samples of soils were collected as part of

the ESP (LANL, 1998), and background samples of vegetation were collected south and upwind of the Laboratory at Bandelier National Monument.

Several soil samples were collected at the eastern end of Area G in the vicinity of the transuranic (TRU) waste pads, the site of the Transuranic Waste Inspectable Storage Project (TWISP), described in detail at the following LANL Internet Address: <http://swo.lanl.gov:80/twisp/default.htm>. The TWISP involves retrieving the TRU and TRU mixed waste originally stored on above-grade asphalt pads under earthen cover (TRU Pads 1, 2, and 4). These wastes are temporarily stored in fabric tension-support structures (TWISP Domes) constructed on an asphalt surface until they are transported to burial at the Waste Isolation Pilot Plant.

Previous A411 Project studies (Childs and Conrad, 1997, 1998, 1999; Conrad et al., 1995, 1996) and one ESH-20 study (Fresquez et al., 1999) have confused the numbering of the TRU Pads at Area G. The reason for this is that they are incorrectly numbered in the Facility for Information Management,

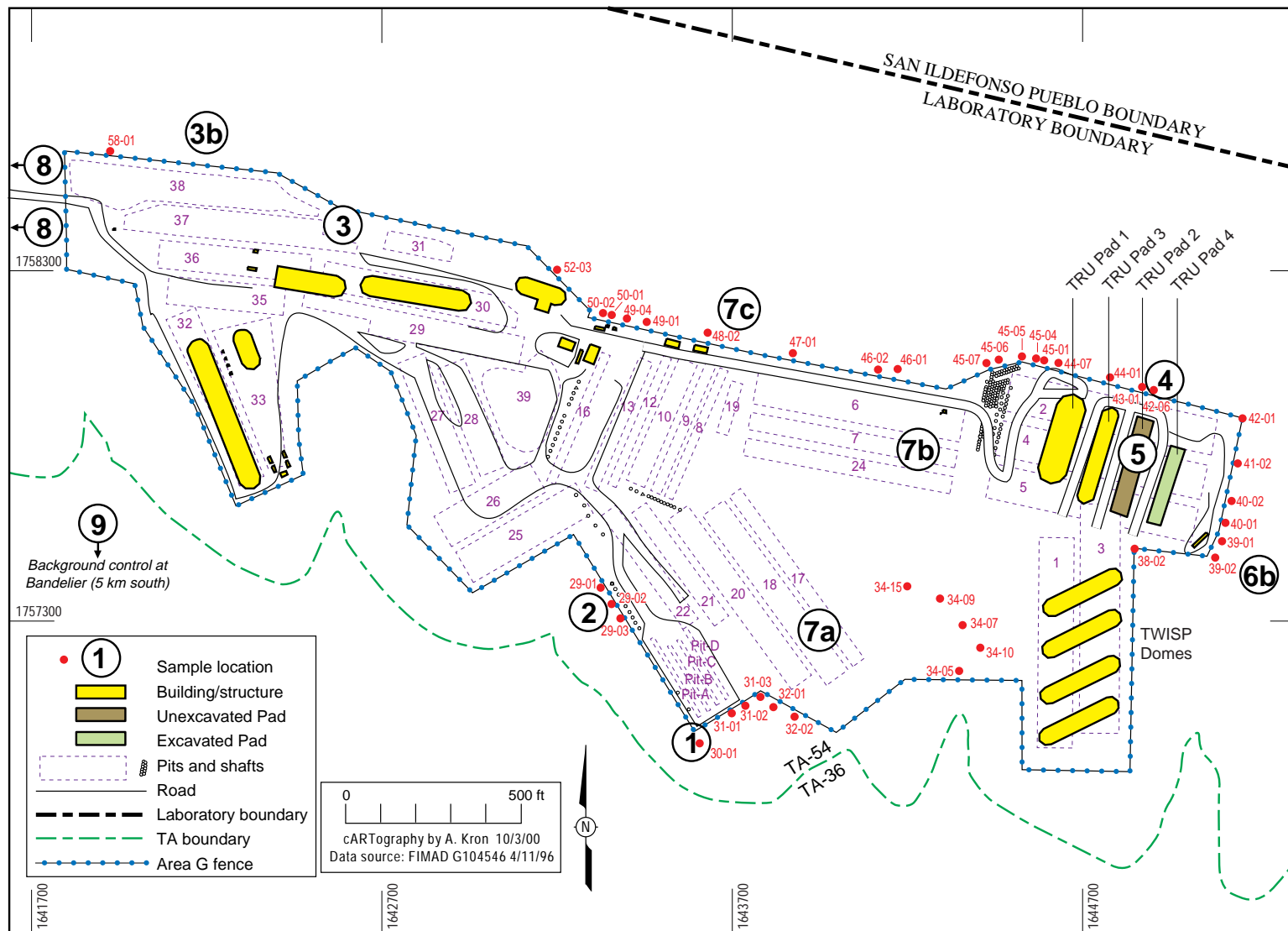


Figure 2. Site/sample locations of soils and vegetation at Area G. (Site #8 is located farther west and Site #9 is located farther south than what is shown here.)

Table 1. Descriptions of sampling locations shown on Figure 2.

<b>Location Number</b>	<b>Description</b>
<b>1</b>	South of tritium shafts immediately outside the Area G fence
<b>2</b>	West of the high-level tritium shafts immediately outside the Area G fence
<b>3</b>	East of Pit 38 (inside the Area G fence)
<b>3b</b>	North of Pit 38 outside the Area G fence
<b>4</b>	Outside the Area G fence north of the transuranic (TRU) waste pads #2 and 4
<b>5</b>	On top of TRU Waste Pad #2 inside the Area G fence
<b>6</b>	On top of TRU Waste Pad #4 inside Area G fence. Site removed before sampling in 1998.
<b>6b</b>	Southeast of TRU Waste Pad #4 outside Area G fence.
<b>7a</b>	Southeastern portions of Pits 17 and 18 (inside the Area G fence)
<b>7b</b>	East end of Pit 7 (inside the Area G fence)
<b>7c</b>	North of Pit 8 outside the Area G fence
<b>8</b>	Proposed expansion area one-half mile west of the entrance gate to Area G and outside the Area G fence
<b>9</b>	Background locations were near Bandelier National Monument approximately 5 km south of Area G.
<b>G-29-01</b>	Southwest of Pit 22 (outside the Area G fence)
<b>G-29-02</b>	Southwest of Pit 22 (outside the Area G fence)
<b>G-29-03</b>	Southwest of Pit 22 (outside the Area G fence)
<b>G-30-01</b>	South of Disposal Trench A (outside the Area G fence)
<b>G-31-01</b>	Southeast of Disposal Trench C (outside the Area G fence)
<b>G-31-02</b>	Southeast of Disposal Trench E (outside the Area G fence)
<b>G-31-03</b>	Southeast of Disposal Trench G (outside the Area G fence)
<b>G-32-01</b>	Southwest of southwestern corner of Pit 20 (outside the Area G fence)
<b>G-32-02</b>	South of southwestern corner of Pit 20 (outside the Area G fence)
<b>G-34-05</b>	West of Pit 1 and four TRU Waste Storage Domes (inside the Area G fence)
<b>G-34-07</b>	West of Pit 1 and four TRU Waste Storage Domes (inside the Area G fence)
<b>G-34-09</b>	South of the eastern end of Pit 24 (inside the Area G fence)
<b>G-34-10</b>	West of Pit 1 and four TWISP Domes (inside the Area G fence)
<b>G-34-15</b>	South of the middle of Pit 24 (inside the Area G fence)

Table 1 cont.

<b>Location Number</b>	<b>Description</b>
<b>G-38-02</b>	South of Pit 5 and TRU Pad 2 (outside the Area G fence)
<b>G-39-01</b>	East of the southeastern corners of Pit 5 and TRU Pad 4 (outside the Area G fence)
<b>G-39-02</b>	Southeast of the southeastern corners of Pit 5 and TRU Pad 4 (outside the Area G fence)
<b>G-40-01</b>	East of the eastern end of Pit 5 and TRU Pad 4 (outside the Area G fence)
<b>G-40-02</b>	East of the eastern end of Pit 4 and TRU Pad 4 (outside the Area G fence)
<b>G-41-02</b>	East of the eastern end of Pit 2 and TRU Pad 4 (outside the Area G fence)
<b>G-42-01</b>	Northeastern corner of Area G (outside the Area G fence)
<b>G-42-06</b>	North of TRU Pad 2 (outside the Area G fence)
<b>G-43-01</b>	North of TRU Pad 2 (outside the Area G fence)
<b>G-44-01</b>	North of northwestern corner of Pit 1 (outside the Area G fence)
<b>G-44-07</b>	North of TRU Pad 1 (outside the Area G fence)
<b>G-45-01</b>	West of western end of Pit 2 (outside the Area G fence)
<b>G-45-04</b>	Northeast of northwestern corner of Pit 2 (outside the Area G fence)
<b>G-45-05</b>	Northeast of northwestern corner of Pit 2 (outside the Area G fence)
<b>G-45-06</b>	Northwest of northwestern corner of Pit 2 (outside the Area G fence)
<b>G-45-07</b>	Northwest of northwestern corner of Pit 2 (outside the Area G fence)
<b>G-46-01</b>	North of eastern half of Pit 6 (outside the Area G fence)
<b>G-46-02</b>	North of eastern half of Pit 6 (outside the Area G fence)
<b>G-47-01</b>	North of western half of Pit 6 (outside the Area G fence)
<b>G-48-02</b>	North of Pit 10 (outside the Area G fence)
<b>G-49-01</b>	North of Pit 13 (outside the Area G fence)
<b>G-49-04</b>	North of Pit 15 (outside the Area G fence)
<b>G-50-01</b>	North of Pit 16 (outside the Area G fence)
<b>G-50-02</b>	North of Pit 16 (outside the Area G fence)
<b>G-52-03</b>	East of Pit 31 (outside the Area G fence)
<b>G-58-01</b>	North of western end of Pit 38 near gate (outside the Area G fence)

Analysis, and Display (FIMAD) system (see Conrad et al., 1995; FIMAD Plot Number 108583). Proceeding from west to east, the TRU pads are correctly numbered 1, 3, 2, and 4 (Figure 2). TRU Pad 3 was never used to store wastes and has had a light-brown-colored fabric tension-support dome over it. Wastes were first excavated from TRU Pad 1, which still has a white-colored fabric tension-support dome over it. TRU Pad 4 was excavated next and currently has a crushed tuff flat surface; thus, Location #6 at this pad was removed after sampling in 1997 and is no longer available for sampling (Fresquez et al., 1998b). TRU Pad 2 is currently not excavated and is the location of ESH-20 Sample Location 5.

At each of the A411 Project sampling locations, grab samples of soil were collected from the top 15 cm (6 in.) of the soil surface with either a stainless steel or a disposable polystyrene scoop or scoopula (LANL, 1995). All of the other soil samples were collected from the surface with a stainless steel soil ring 10 cm (4 in.) in diameter driven 5 cm (2 in.) into the soil (ASTM, 1990). Samples were collected from the center and corners of a square plot of 10 m (33

ft) per side. The five subsamples were combined and mixed thoroughly in a three-gallon Ziploc® bag, and a subsample from the composite was placed in a 500-mL poly bottle.

All soil samples were submitted under full chain-of-custody to the Inorganic Trace Analysis group (CST-9) for analysis of  $^3\text{H}$ ,  $^{238}\text{Pu}$ ,  $^{239,240}\text{Pu}$ ,  $^{137}\text{Cs}$ ,  $^{\text{tot}}\text{U}$ ,  $^{90}\text{Sr}$ , and  $^{241}\text{Am}$ . All methods of radiochemical analyses have been described previously (Fresquez et al., 1996a; Childs and Conrad, 1999). The only difference in assay techniques involved  $^{241}\text{Am}$ , which was determined by alpha spectroscopy for one set of samples (Fresquez et al., 1996a) and by gamma spectroscopy for the A411 Project samples (Childs and Conrad, 1999). Radionuclide results were reported in pCi mL<sup>-1</sup> of soil moisture for  $^3\text{H}$ , µg g<sup>-1</sup> dry soil for  $^{\text{tot}}\text{U}$ , and pCi g<sup>-1</sup> dry soil for all the other isotopes.

Samples of overstory and understory vegetation were collected when both types were found. Clippings of tree shoots (overstory) or the top growth of grasses and forbs (understory) were composited and transported to the laboratory. Understory samples were

collected at all sampling locations from the same 10- by 10-m plots as the soil samples, but sampling locations 5, 7a, and 7b did not contain overstory cover. Overstory samples were mainly from piñon pine (*Pinus edulis*) because piñon pine is the prevalent tree in the area (Tierney and Foxx, 1982). Samples of the overstory consisted of the tips of tree shoots approximately 2.5 to 5.1 cm (1 to 2 in.) in length, which were collected at a height of 1.3 to 1.6 m (4 to 5 ft).

Personnel collecting samples wore plastic gloves and used clean shears to clip vegetation; all materials were decontaminated (washed with soap and water) between sampling locations. Vegetation clippings ranged from 0.9 to 1.4 kg (2 to 3 lb) of composited material, which was placed in labeled double-bagged Ziploc® plastic bags and transported to the laboratory in a locked ice chest. Each sample was divided into two subsets to provide enough material for analysis of  $^3\text{H}$  and the other radionuclides. Samples were not washed and thus represent the total concentration of radionuclides deposited on the plant surfaces by rainsplash and/or airborne deposition as well as radionuclides taken

up by plant roots. The total radionuclide concentration is a realistic measure of the amount available to receptors that consume the plants at Area G.

Part of the vegetation sample was subsampled for  $^3\text{H}$  analysis. The subsamples were placed in glass beakers to collect distillate water (Salazar, 1984). The remaining portion of each subsample was placed in a 1-L glass beaker and slowly ashed at 500°C for 120 h. The ashed sample was pulverized and homogenized, then transferred to labeled 500-mL poly bottles and submitted with the distillate samples under full chain-of-custody to CST-9 for the analysis of  $^3\text{H}$ ,  $^{238}\text{Pu}$ ,  $^{239,240}\text{Pu}$ ,  $^{137}\text{Cs}$ ,  $^{\text{tot}}\text{U}$ ,  $^{241}\text{Am}$ ,  $^{90}\text{Sr}$ . All methods of radiochemical analyses have been described previously (Fresquez et al., 1996b). Radionuclide results were reported in pCi mL<sup>-1</sup> of tissue moisture for  $^3\text{H}$ , µg g<sup>-1</sup> ash for  $^{\text{tot}}\text{U}$ , and pCi g<sup>-1</sup> ash for all the other isotopes. Results reported in grams of ash are usually two to four orders of magnitude greater than live (wet) weight.

### III. RESULTS

***Radionuclide Concentrations in Soils.*** Results of radionuclide

concentrations in soils are given in Table 2. The actual CST-9 analytical reports are included in Appendix A for reference. Detectable concentrations of radionuclides of interest were found in most samples. A detectable concentration was considered a result that was greater than two times the counting uncertainty. Measured concentrations for  $^{239,240}\text{Pu}$ ,  $^{238}\text{Pu}$ , and  $^3\text{H}$  were greater than the regional statistical reference level (RSRL) at most locations for both sets of samples. In addition, 90% of the A411 Project samples and 36% of the other soil samples contained  $^{241}\text{Am}$  concentrations greater than the RSRL. The RSRL is the mean + two standard deviations of the upper 95% confidence interval of background concentrations. The data for the background (BG) concentrations were collected from regional, non-LANL soils collected from 1993 through 1997 (LANL, 1998).

Several sampling locations were close to one another within the two project sampling schemes. Near the  $^3\text{H}$  shafts, sample location 1 was close to locations G-30-01, G-31-01, and G-31-02, and sample location 2 was close to sampling locations G-29-01, G-29-02,

and G-29-03. Sample locations 3b and G-58-01 are near the northwestern corner of Area G. Sample locations 6b and G-38-02 are both near the corner of Area G that is southeast of TRU Waste Pad #4. Sample locations 4, G-43-01, and G-42-06 are all directly north of TRU Waste Pads #2 and #4. Sample locations 7c and G-48-02 are both north of Pit 8 on the northern extremity of Area G. The two sample locations inside of Area G, locations 7a and 7b, are in the proximity of G-32-01, G-32-02, G-34-09 and G-34-10, and G-46-01 and G-46-02, respectively.

The  $^3\text{H}$  concentrations observed in the soil samples exhibited substantial spatial variability (Table 2, Figures 3 and 4): about 75% of the soils analyzed for  $^3\text{H}$  had concentrations that ranged from 0.6 to 227 pCi g<sup>-1</sup>. The mean  $^{137}\text{Cs}$  concentration of all of the soil samples collected was 12.31 pCi g<sup>-1</sup> with a coefficient of determination (standard deviation multiplied by 100/mean concentration) of 286%. Tritium concentrations for 73% of the A411 Project soils and 48% of the other samples collected at Area G sites were greater than the RSRL (Table 2). The  $^3\text{H}$

Table 2. Radionuclide concentrations in soils (dry weight) collected from Area G in 1999.<sup>1</sup> Bold values are equal to or greater than regional statistical reference level (RSRL) values and “NA” indicates that no analysis was performed.

Sample Locations	Element						
	<sup>3</sup> H (pCi mL <sup>-1</sup> ) <sup>2</sup>	<sup>241</sup> Am (pCi g <sup>-1</sup> )	<sup>137</sup> Cs (pCi g <sup>-1</sup> )	<sup>238</sup> Pu (pCi g <sup>-1</sup> )	<sup>239,240</sup> Pu (pCi g <sup>-1</sup> )	<sup>90</sup> Sr (pCi g <sup>-1</sup> )	<sup>tot</sup> U (μg g <sup>-1</sup> )
1 <sup>3</sup>	<b>65.10</b>	0.011	0.40	<b>0.015</b>	<b>0.040</b>	-0.42	2.37
2	<b>81.90</b>	0.006	0.37	0.006	<b>0.027</b>	0.21	2.35
3	<b>1.54</b>	<b>0.023</b>	0.01	<b>0.012</b>	<b>0.046</b>	<b>0.99</b>	<b>3.52</b>
3b	0.08	0.003	0.30	0.002	0.016	-0.10	<b>3.53</b>
4	<b>1.91</b>	<b>0.146</b>	0.42	<b>0.364</b>	<b>0.775</b>	<b>1.58</b>	3.18
5	<b>13.30</b>	0.008	0.04	0.002	0.013	-0.04	2.47
6b	0.53	<b>0.062</b>	0.34	<b>0.014</b>	<b>0.334</b>	0.43	<b>3.34</b>
7a	<b>3.95</b>	0.005	0.01	0.005	0.012	-0.09	2.80
7b	<b>3.41</b>	0.009	0.03	<b>0.035</b>	<b>0.027</b>	0.44	2.37
7c	<b>2.24</b>	<b>0.141</b>	0.42	<b>0.091</b>	<b>1.015</b>	<b>0.84</b>	2.58
8	0.13	0.011	0.37	<b>0.009</b>	<b>0.020</b>	0.51	3.16
G-29-01	<b>13.80</b>	<b>0.402</b>	0.23	<b>0.031</b>	<b>0.031</b>	NA	NA
G-29-02	<b>24.90</b>	<b>0.522</b>	0.26	<b>0.016</b>	<b>0.055</b>	NA	NA
G-29-03	<b>226.50</b>	0.000	0.40	<b>0.022</b>	<b>0.033</b>	NA	NA
G-30-01	<b>69.90</b>	<b>0.155</b>	0.07	0.004	0.010	NA	NA
G-31-01	<b>32.10</b>	0.000	<b>1.38</b>	<b>0.032</b>	<b>0.106</b>	NA	NA
G-31-02	<b>16.30</b>	<b>0.910</b>	0.10	0.007	0.007	NA	NA
G-31-03	<b>10.20</b>	<b>0.320</b>	0.30	0.004	<b>0.036</b>	NA	NA
G-32-01	<b>11.30</b>	<b>0.730</b>	0.09	0.003	0.007	NA	NA
G-32-02	<b>4.88</b>	<b>0.461</b>	0.49	0.007	<b>0.091</b>	NA	NA
G-34-05	0.27	<b>0.850</b>	0.11	<b>0.020</b>	<b>0.079</b>	NA	NA
G-34-07	0.17	<b>0.806</b>	0.17	0.005	<b>0.293</b>	NA	NA
G-34-09	0.14	<b>0.649</b>	0.08	0.005	<b>0.035</b>	NA	NA

Table 2 cont.

Sample Locations	Element						
	$^3\text{H}$ (pCi mL <sup>-1</sup> ) <sup>2</sup>	$^{241}\text{Am}$ (pCi g <sup>-1</sup> )	$^{137}\text{Cs}$ (pCi g <sup>-1</sup> )	$^{238}\text{Pu}$ (pCi g <sup>-1</sup> )	$^{239,240}\text{Pu}$ (pCi g <sup>-1</sup> )	$^{90}\text{Sr}$ (pCi g <sup>-1</sup> )	$^{\text{tot}}\text{U}$ (μg g <sup>-1</sup> )
G-34-10	0.15	<b>1.100</b>	0.49	<b>0.039</b>	<b>1.680</b>	NA	NA
G-34-15	<b>0.71</b>	<b>0.750</b>	0.12	<b>0.215</b>	<b>0.072</b>	NA	NA
G-38-02	<b>2.38</b>	<b>0.753</b>	0.17	<b>0.070</b>	<b>1.048</b>	NA	NA
G-39-01	0.41	<b>0.335</b>	0.08	<b>0.919</b>	<b>0.557</b>	NA	NA
G-39-02	<b>0.76</b>	<b>0.173</b>	0.07	<b>0.085</b>	<b>0.179</b>	NA	NA
G-40-01	<b>0.98</b>	<b>0.479</b>	0.33	<b>0.294</b>	<b>0.489</b>	NA	NA
G-40-02	<b>0.68</b>	<b>0.310</b>	0.13	<b>0.079</b>	<b>0.164</b>	NA	NA
G-41-02	<b>0.67</b>	<b>0.311</b>	0.29	<b>0.869</b>	<b>0.313</b>	NA	NA
G-42-01	<b>1.57</b>	<b>0.322</b>	0.17	<b>1.797</b>	<b>0.206</b>	NA	NA
G-42-06	<b>1.71</b>	<b>0.136</b>	0.14	<b>0.055</b>	<b>0.295</b>	NA	NA
G-43-01	<b>0.91</b>	<b>0.331</b>	0.36	<b>0.571</b>	<b>4.260</b>	NA	NA
G-44-01	<b>3.97</b>	<b>0.338</b>	0.25	<b>0.445</b>	<b>0.372</b>	NA	NA
G-44-07	<b>0.62</b>	<b>0.163</b>	0.27	<b>0.050</b>	<b>0.148</b>	NA	NA
G-45-01	<b>7.90</b>	<b>0.387</b>	0.22	<b>0.439</b>	<b>0.495</b>	NA	NA
G-45-04	<b>1.69</b>	0.000	0.30	<b>0.322</b>	<b>0.278</b>	NA	NA
G-45-05	<b>0.65</b>	<b>0.271</b>	<b>0.62</b>	<b>0.744</b>	<b>0.894</b>	NA	NA
G-45-06	<b>4.27</b>	<b>0.150</b>	0.13	<b>0.225</b>	<b>0.153</b>	NA	NA
G-45-07	<b>6.80</b>	<b>0.417</b>	0.33	<b>3.279</b>	<b>0.524</b>	NA	NA
G-46-01	<b>1.20</b>	<b>0.773</b>	0.27	0.005	<b>1.597</b>	NA	NA
G-46-02	<b>1.24</b>	<b>2.780</b>	0.14	<b>0.262</b>	<b>0.284</b>	NA	NA
G-47-01	0.42	<b>0.169</b>	<b>0.52</b>	0.001	<b>0.174</b>	NA	NA
G-48-02	0.15	0.000	0.14	<b>0.017</b>	<b>0.222</b>	NA	NA
G-49-01	<b>0.78</b>	<b>0.416</b>	0.13	<b>0.035</b>	<b>0.380</b>	NA	NA
G-49-04	0.53	<b>1.110</b>	0.11	<b>0.012</b>	<b>0.053</b>	NA	NA

Table 2 cont.

Sample Locations	Element						
	$^3\text{H}$ (pCi mL <sup>-1</sup> ) <sup>2</sup>	$^{241}\text{Am}$ (pCi g <sup>-1</sup> )	$^{137}\text{Cs}$ (pCi g <sup>-1</sup> )	$^{238}\text{Pu}$ (pCi g <sup>-1</sup> )	$^{239,240}\text{Pu}$ (pCi g <sup>-1</sup> )	$^{90}\text{Sr}$ (pCi g <sup>-1</sup> )	$^{\text{tot}}\text{U}$ (μg g <sup>-1</sup> )
G-50-01	0.55	<b>1.340</b>	0.07	<b>0.015</b>	<b>0.073</b>	NA	NA
G-50-02	<b>0.83</b>	<b>0.397</b>	0.13	<b>0.053</b>	<b>0.106</b>	NA	NA
G-52-03	0.17	<b>0.252</b>	0.08	<b>0.054</b>	<b>1.964</b>	NA	NA
G-58-01	0.47	<b>0.526</b>	0.39	<b>0.084</b>	<b>0.043</b>	NA	NA
<b>BG</b>	0.13	0.011	0.54	-0.000	0.020	0.52	3.27
<b>RSRL</b> <sup>4</sup>	0.60	0.013	0.51	0.008	0.019	0.71	3.30
<b>SAL</b> <sup>5</sup>	1900.0 <sup>6</sup>	22.0	5.1	27.0	24.0	4.4	29.0

<sup>1</sup> Sample locations listed in Table 1.

<sup>2</sup> Concentration for  $^3\text{H}$  is based on soil moisture.

<sup>3</sup> Samples without a G prefix collected at the 0- to 2-inch depth by Ecology Group (Fresquez et al., 1999); samples with a G prefix collected at the 0- to 6-inch depth by Hazardous and Solid Waste Group (Childs and Conrad, 1999).

<sup>4</sup> Regional statistical reference level; this is the upper (95%) level background concentrations (mean + 2 std dev) from 1992-1999 (LANL 2000).

<sup>5</sup> Screening Action Level (FIMAD 1997).

<sup>6</sup> Equivalent to a SAL value of 260 pCi g<sup>-1</sup>  $^3\text{H}$  for a soil at a water content of 12%.

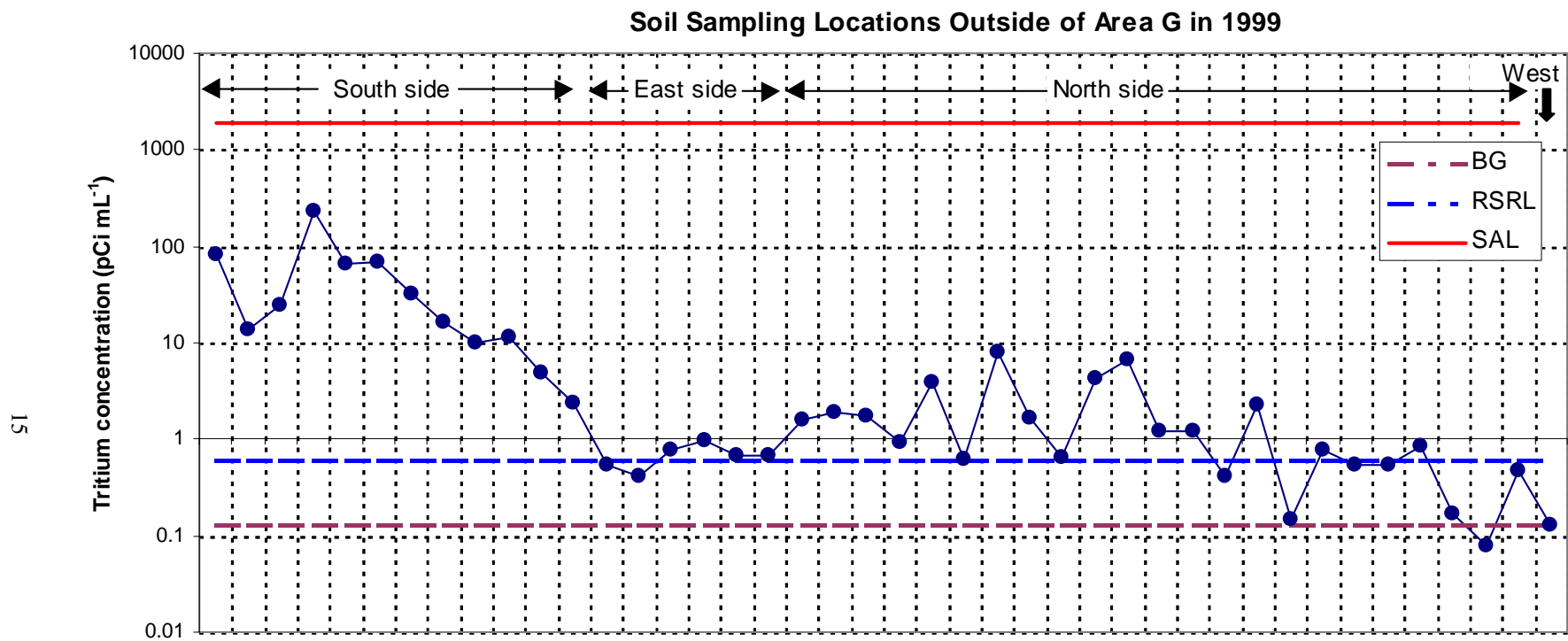


Figure 3. Tritium concentrations in soil samples collected outside of Area G in 1999.

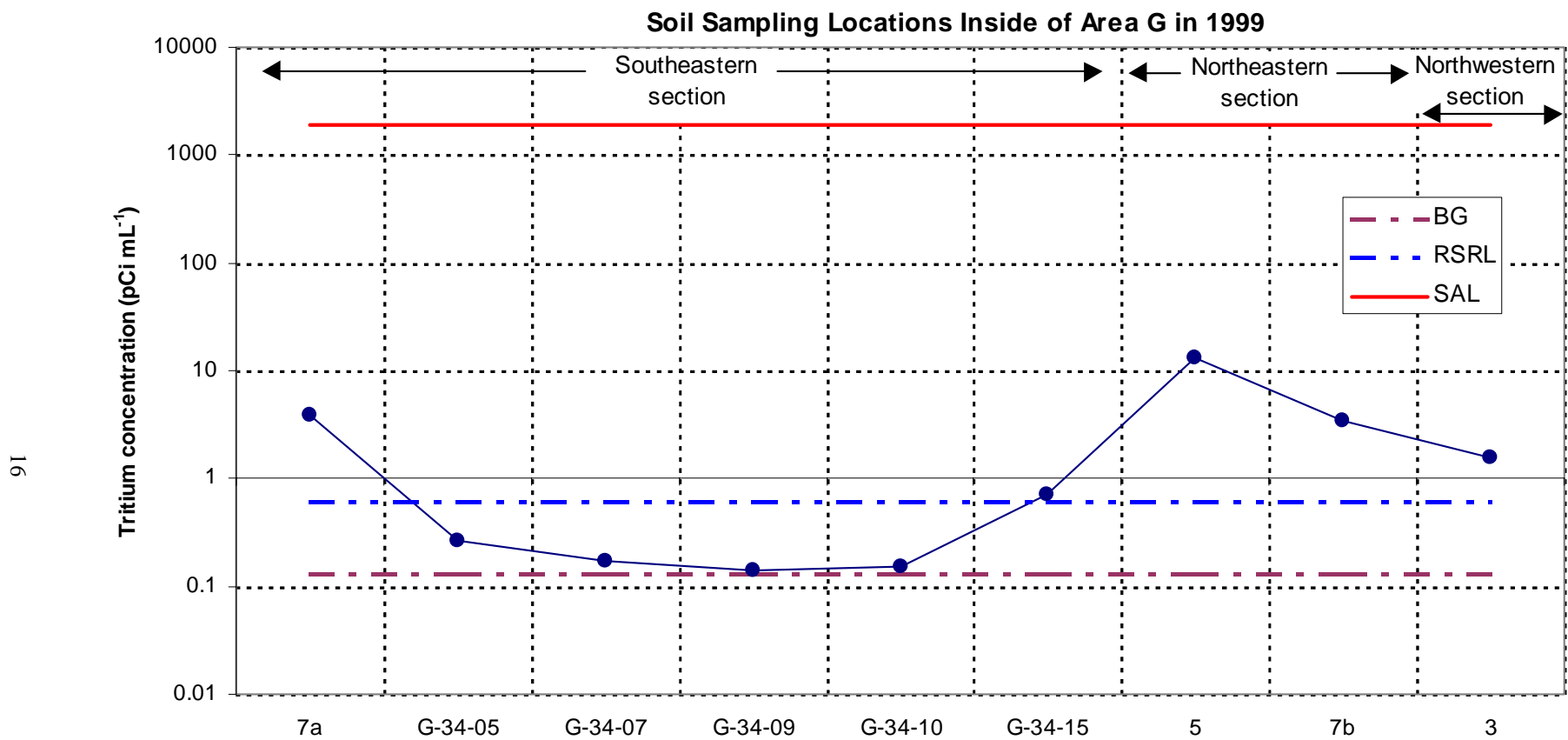


Figure 4. Tritium concentrations in soil samples collected inside of Area G in 1999.

data for the soils collected outside and inside of Area G are presented in Figures 3 and 4. Samples in the proximity of the  $^3\text{H}$  shafts (locations 1, 2, 7a, G-29-01, G-29-02, G-29-03, G-30-01, G-31-01, G-31-02, G-31-03, G-32-01, G-45-01, and G-45-07, see Figure 2) contained an average  $^3\text{H}$  concentration of 39.3 pCi mL<sup>-1</sup>. These locations also contained the largest concentration of  $^3\text{H}$  observed in the study, 226.5 pCi mL<sup>-1</sup>: considerably less than the SAL of 1900 pCi mL<sup>-1</sup>. The rest of the soil samples containing  $^3\text{H}$  concentrations greater than the RSRL occurred in a mosaic pattern around the northeastern corner of Area G (locations 4, 7b, G-38-02, G-42-01, G-42-06, G-44-01, G-45-04, G-45-06, G-46-01, and G-46-02). The latter soil samples contained an average  $^3\text{H}$  concentration of 2.34 pCi mL<sup>-1</sup> and a maximum  $^3\text{H}$  concentration of 4.27 pCi mL<sup>-1</sup>.

Although the A411 Project samples were not assayed for  $^{90}\text{Sr}$ , soil concentrations greater than RSRL values were found at only three locations (3, 4, and 7c). The concentrations measured in these three samples (Table 2), however, were only slightly larger than the RSRLs, and there is a possibility that the

sample values reflect analytical error (e.g., they are positively biased) instead of actual contamination from Area G operations. These results agree with similar data collected in 1998 at these locations, which marked the first time concentrations of  $^{90}\text{Sr}$  have been found in excess of RSRLs at Area G.

Concentrations of  $^{137}\text{Cs}$  found in soils collected at Area G in 1999 ranged from 0.01 to 1.38 pCi g<sup>-1</sup>. Over 94% of the soil samples analyzed for  $^{137}\text{Cs}$  had concentrations that were less than RSRLs, regardless of how and where the samples were collected (Table 2, Figures 5 and 6). Only the samples from locations G-31-01 and G-45-05 contained  $^{137}\text{Cs}$  concentrations slightly greater than the RSRL. The results from location G-45-05 were expected since the TRU pads are the likely source for the radionuclides; similar results were found in the samples collected at the adjacent location 4 in 1998 (Fresquez et al., 1998a).

The  $^{137}\text{Cs}$  concentrations observed in the soil samples exhibited much less spatial variability than tritium (Figures 3 and 4): about 67% of the soils analyzed for  $^{137}\text{Cs}$  had concentrations

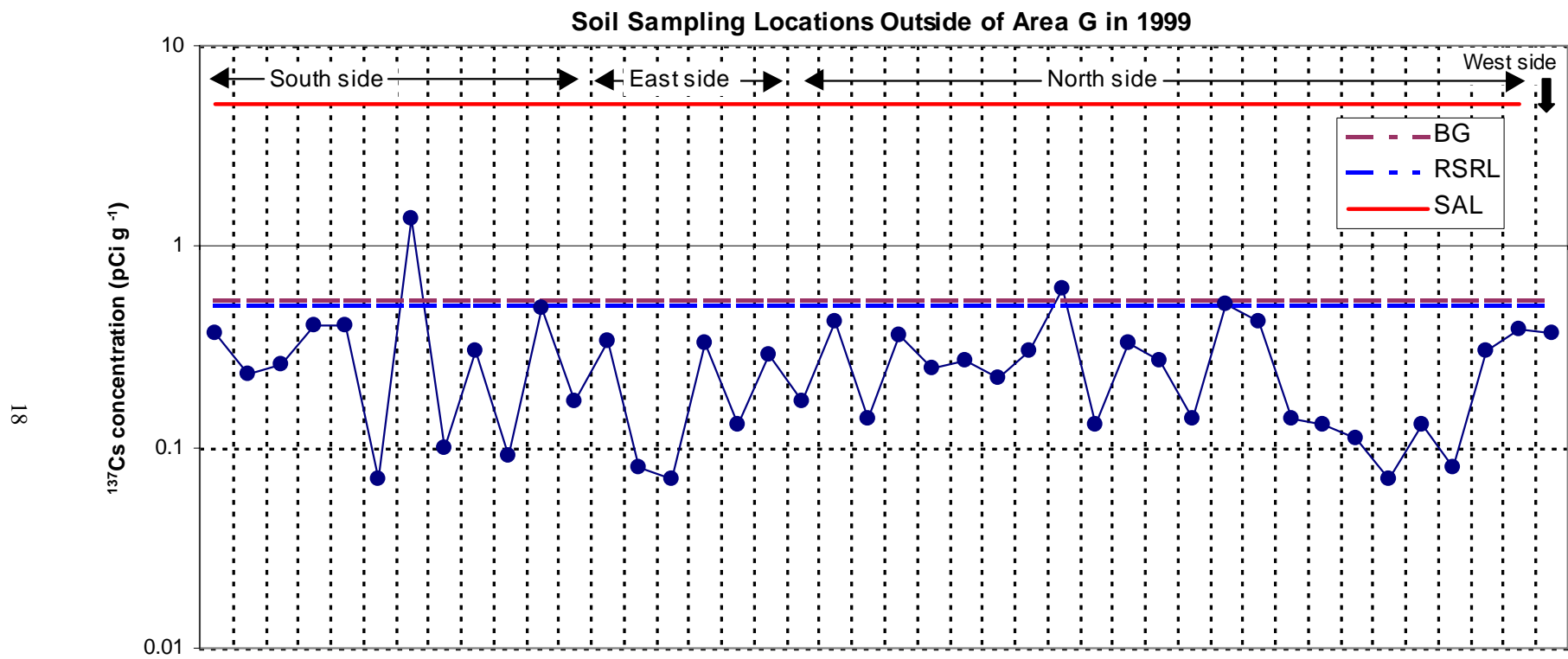


Figure 5. Concentrations of  $^{137}\text{Cs}$  in soil samples collected outside of Area G in 1999.

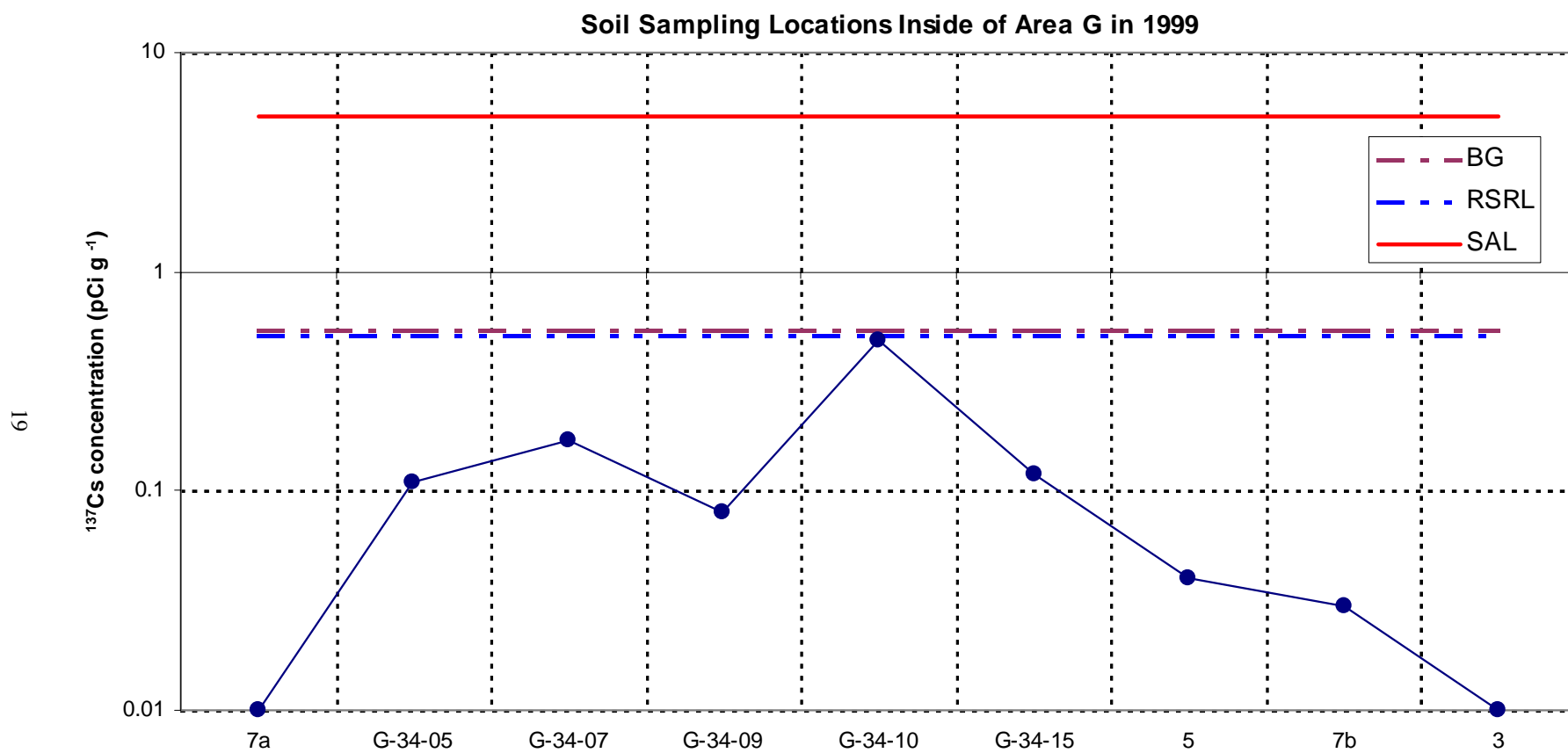


Figure 6. Concentrations of  $^{137}\text{Cs}$  in soil samples collected inside of Area G in 1999.

that ranged from 0.1 to 0.51 pCi g<sup>-1</sup> (Table 2). The mean <sup>137</sup>Cs concentration of all of the soil samples collected (Table 2) was 0.25 pCi g<sup>-1</sup> with a coefficient of determination of 87.1%.

Concentrations of <sup>tot</sup>U were lower than RSRLs for all Area G locations except for locations 3, 3b, 6b, and 5. Uranium concentrations in Bandelier Tuff range up to 11 µg g<sup>-1</sup> (Crowe et al., 1978) and could explain the observed variation in the results. The range of <sup>tot</sup>U in the soil samples was 2.35 µg g<sup>-1</sup> to 3.53 µg g<sup>-1</sup>, concentrations that do not pose significantly larger health risks than background concentrations to humans or the environment.

Concentrations of <sup>239,240</sup>Pu found in soils collected at Area G in 1999 ranged from 0.027 to 4.26 pCi g<sup>-1</sup>, whereas <sup>238</sup>Pu concentrations ranged from 0.012 to 3.28 pCi g<sup>-1</sup> (Table 2). The concentrations of <sup>239,240</sup>Pu and <sup>238</sup>Pu found in soil samples were usually greater than RSRLs, regardless of how and where the samples were collected. Almost 93% and 78% of the A411 Project soil samples contained greater than RSRL concentrations of <sup>239,240</sup>Pu and <sup>238</sup>Pu, respectively. Similar results were

observed with the other samples: 64% and 55% of the samples contained greater than RSRL concentrations of <sup>239,240</sup>Pu and <sup>238</sup>Pu, respectively.

Concentrations of <sup>239,240</sup>Pu and <sup>238</sup>Pu found in soil, as well as their ratios, are presented in Figures 7 and 8 for the samples with greater than RSRLs collected outside and inside of Area G, respectively. Concentrations of these two isotopes in soils were not significantly correlated, as can be observed by inspection of Figures 7 and 8. Thus, although the soil at location G-43-01 contained the largest concentration of <sup>239,240</sup>Pu, the soil from location G-45-07 contained the largest concentration of <sup>238</sup>Pu (Figure 7).

Over 75% of the soil samples collected (with greater than RSRLs) contained ratios of the concentrations of <sup>239,240</sup>Pu to <sup>238</sup>Pu less than five; for the remaining 10 samples, this ratio ranged from 5 to 43 (Figures 7 and 8). The latter samples usually had enhanced concentrations of <sup>239,240</sup>Pu, rather than depressed concentrations of <sup>238</sup>Pu, that accounted for their large ratios of the concentrations of <sup>239,240</sup>Pu to <sup>238</sup>Pu (Figures 7 and 8).

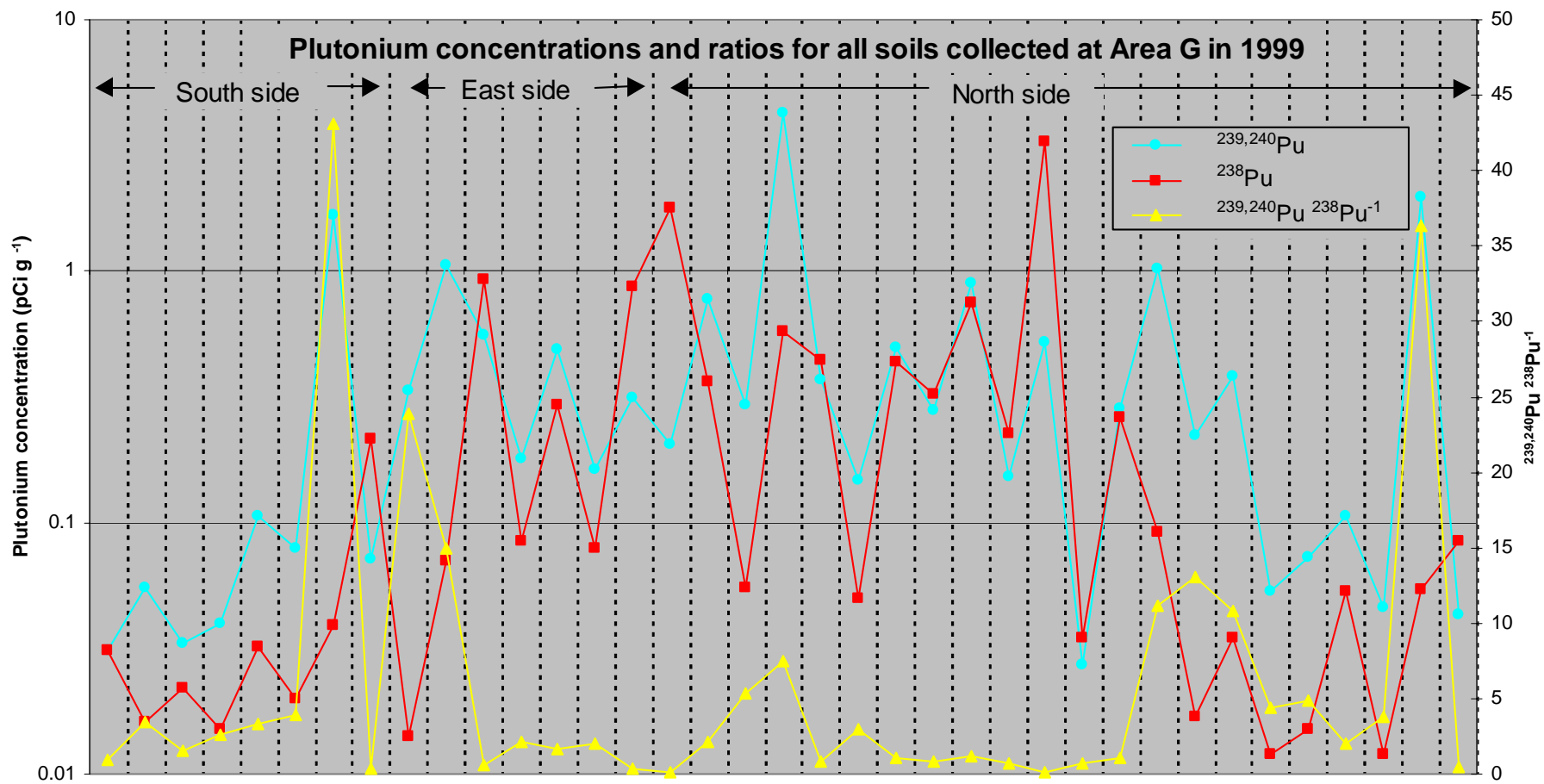


Figure 7. Plutonium concentrations and plutonium isotope ratios in soil samples collected outside of Area G in 1999.

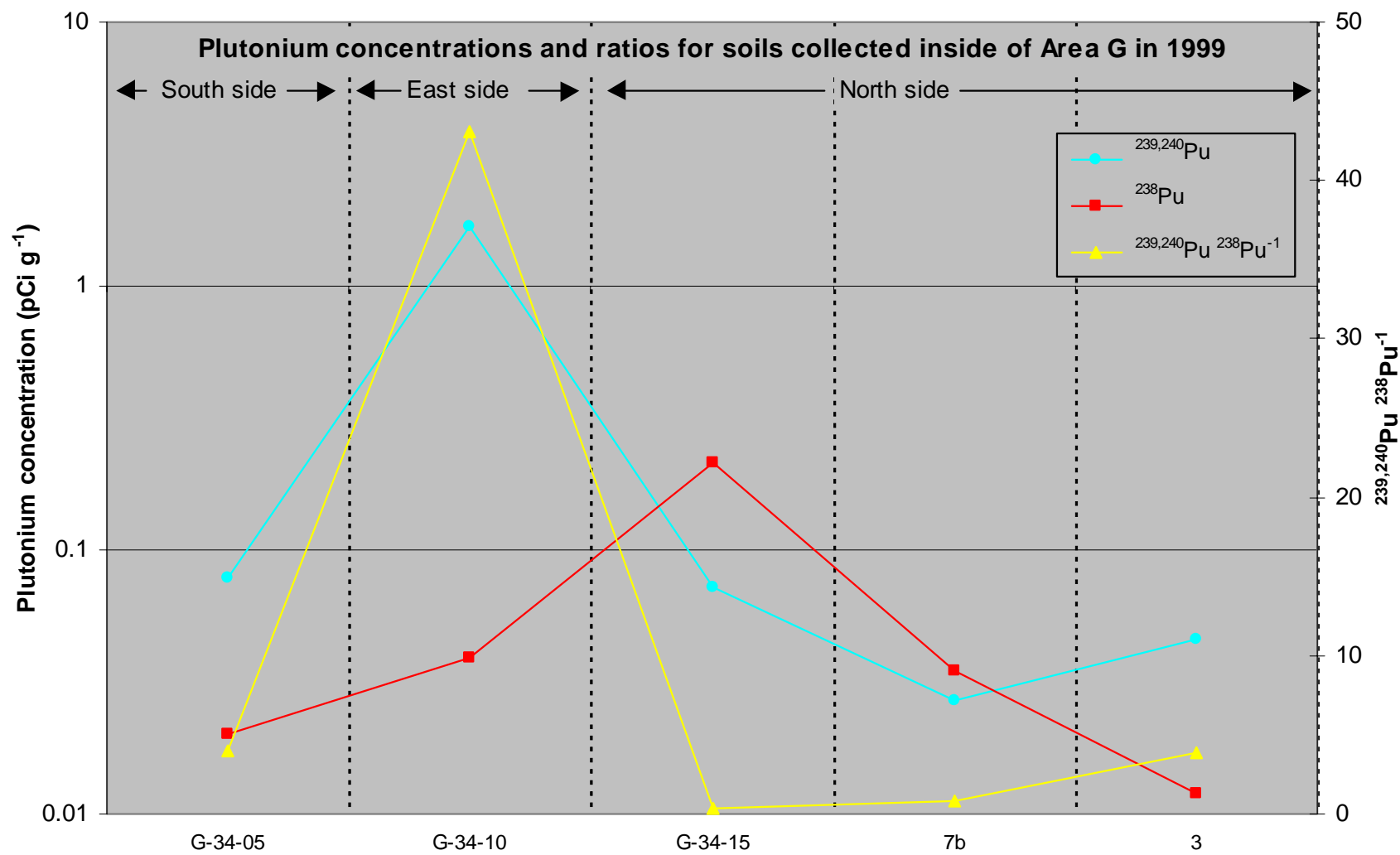


Figure 8. Plutonium concentrations and plutonium isotope ratios in soil samples collected inside of Area G in 1999.

Perimeter soil samples collected at the northeastern corner of Area G (sample locations G-38-02, 6b, G-43-01, and G-42-06) and the north-central section of Area G (locations 7c, G-48-02, G-49-01, and G-52-03) exhibited large ratios of the concentrations of  $^{239,240}\text{Pu}$  to  $^{238}\text{Pu}$  (Figures 2, 7, 8). One location that was sampled in a drainage area inside of Area G (G-34-10) contained the highest observed ratio of the concentrations of  $^{239,240}\text{Pu}$  to  $^{238}\text{Pu}$ . The locations in the northeastern corner and the north-central portions of Area G are near the TRU pads and Pits 8, 9, 10, 12, 13, 15, and 16, respectively, all of which contain waste that was contaminated with both plutonium isotopes. The sample collected at G-34-10 was also adjacent to a TRU pad.

Over 78% of the soil samples analyzed for  $^{241}\text{Am}$  had concentrations that were greater than RSRLs, regardless of either how and where the samples were collected, or the  $^{241}\text{Am}$  assay technique (Table 2, Figures 9 and 10). Concentrations of  $^{241}\text{Am}$  found in soils collected at Area G in 1999 ranged from 0.0 to 2.78 pCi g<sup>-1</sup>. However,  $^{241}\text{Am}$  concentrations observed in the soil samples exhibited much less spatial

variability than either tritium (Figures 3 and 4) or plutonium (Figures 7 and 8). About 67% of the soils analyzed for  $^{241}\text{Am}$  had concentrations that ranged from 0.1 to 1 pCi g<sup>-1</sup>.

Measurements of gross alpha, beta, and gamma radioactivity for the soils collected from Area G in 1999 are presented in Table 3. The gross alpha and beta radioactivity measurements for the soils were uniformly less than those measured for the RSRL sample. The gross gamma radioactivity measurements for the soil samples were almost all greater than that measured for the background sample, reflecting the presence of  $^{241}\text{Am}$  (Figures 9 and 10).

Many of the samples collected contained concentrations of radionuclides that were greater than the RSRLs. However, the concentrations of all nuclides in the samples were less than LANL SALs. The SALs were developed to keep potential doses to humans residing on the site to 10 mrem yr<sup>-1</sup> or less (FIMAD, 1997). Based on the results provided in this report, exposure to Area G soils would result in doses much less than the 10 mrem yr<sup>-1</sup> limit from any one radionuclide or from all

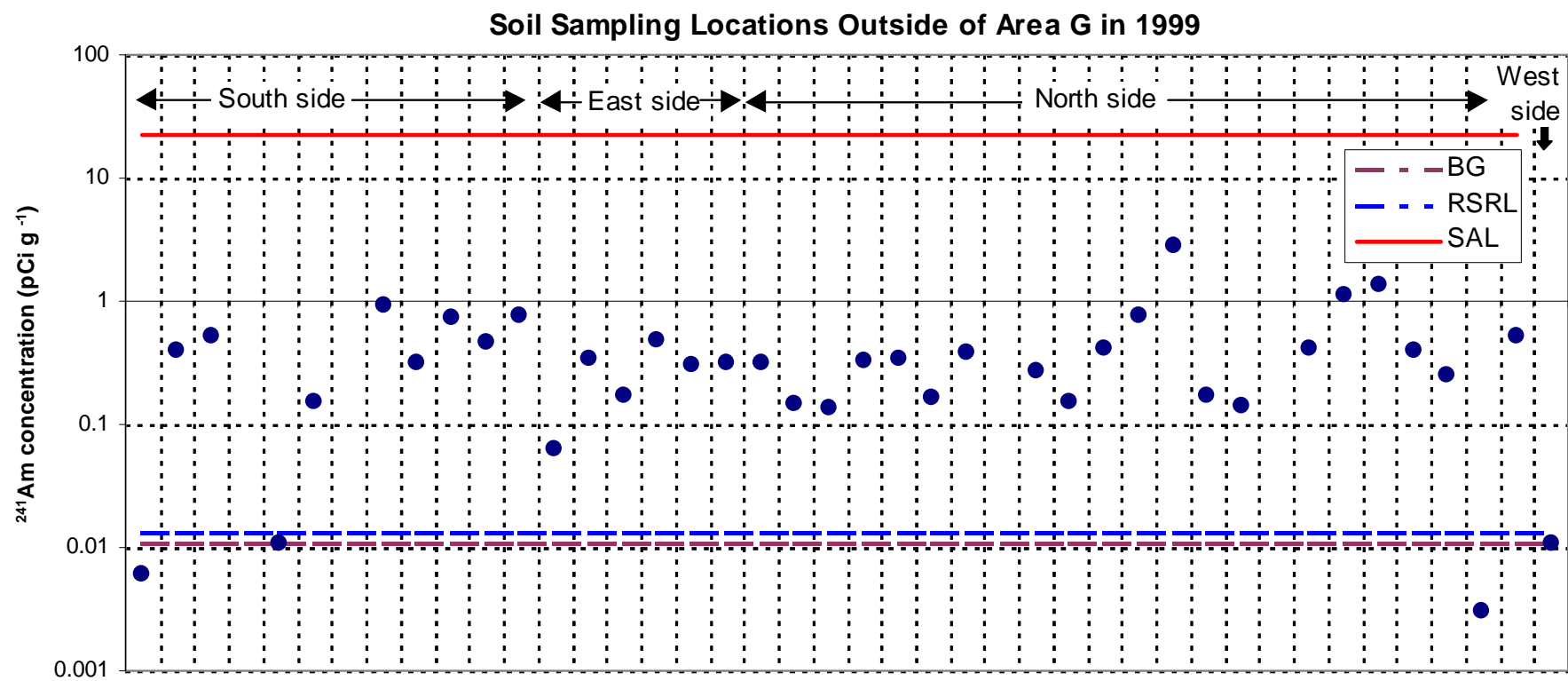


Figure 9. Concentrations of  $^{241}\text{Am}$  in soil samples collected outside of Area G in 1999.

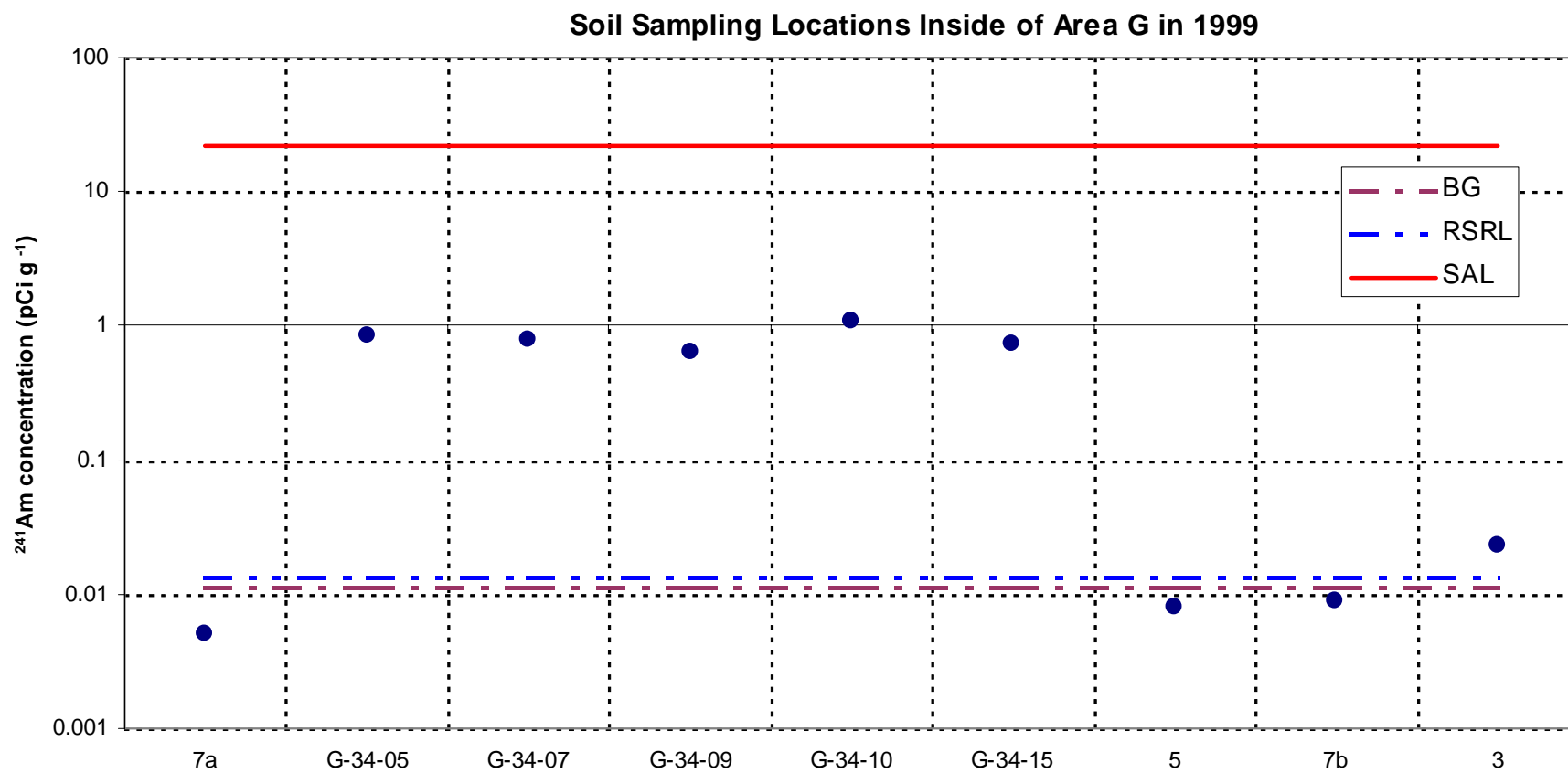


Figure 10. Concentrations of  $^{241}\text{Am}$  in soil samples collected inside of Area G in 1999.

Table 3. Gross alpha, beta, and gamma radioactivity in soils (dry weight) collected from Area G in 1999.<sup>1</sup> Bold values are equal to or greater than RSRL values.

Sampling Location	Radioactivity (pCi g <sup>-1</sup> )		
	Gross Alpha	Gross Beta	Gross Gamma
1	5.07	4.20	<b>4.3</b>
2	5.18	4.34	4.0
3	5.57	4.43	<b>5.2</b>
3b	5.70	4.25	3.6
4	7.61	4.59	<b>4.9</b>
5	3.38	2.15	<b>5.2</b>
6b	5.96	4.34	<b>4.3</b>
7a	4.54	3.33	<b>4.7</b>
7b	4.41	2.72	<b>4.2</b>
7c	6.05	3.94	<b>4.5</b>
8	6.44	4.75	3.3
<b>BG</b>	8.82	5.86	3.4
<b>RSRL</b>	8.4	7.2	4.1

<sup>1</sup> Sample locations listed in Table 1 and BG = background (south and upwind of LANL).

radionuclides combined. Therefore, exposure to radionuclides in Area G soils pose little risk to animals (deer and elk) and humans and are considered of no concern (Ferenbaugh et al., 1999).

***Radionuclide Concentrations in Vegetation.*** Table 4 shows radionuclide concentrations in unwashed vegetation collected from within and around Area G during the 1999 growing season. The CST-9 analytical reports are included in Appendix B for reference.

Understory vegetation was collected at each sampling location, but overstory vegetation was collected only

at locations 1, 2, 3, 3b, 4, 6b, 7c, 8, and the background location because there was no overstory at locations 5, 7a, or 7b. Most radionuclide concentrations in unwashed overstory and understory vegetation were equal to or slightly greater than RSRLs. The RSRL mean values + two standard deviations were calculated from data collected from 1994 to 1997 (Fresquez et al., 1995, 1996b, 1997b).

Tritium concentrations in vegetation samples had a mean concentration of 288 pCi mL<sup>-1</sup> and ranged from -0.18 to 2535 pCi mL<sup>-1</sup> for

Table 4. Radionuclide concentrations in unwashed vegetation collected from Area G in 1999. Bold values are equal to or greater than RSRL values, and “ND” indicates that no sample was collected.

Sample Location and Type <sup>1</sup>	<sup>3</sup> H (pCi mL <sup>-1</sup> ) <sup>2</sup>	<sup>241</sup> Am (pCi g <sup>-1</sup> ash)	<sup>137</sup> Cs (pCi g <sup>-1</sup> ash)	<sup>238</sup> Pu (pCi g <sup>-1</sup> ash)	<sup>239,240</sup> Pu (pCi g <sup>-1</sup> ash)	<sup>90</sup> Sr (pCi g <sup>-1</sup> ash)	<sup>tot</sup> U (μg g <sup>-1</sup> ash)
1-OS	<b>165.70</b>	0.008	0.048	-0.0001	0.0006	6.48	0.73
1-US	<b>637.00</b>	0.003	0.033	0.0026	0.0052	<b>4.97</b>	0.82
2-OS	<b>678.00</b>	0.015	0.015	-0.0007	0.0019	8.81	0.88
2-US	<b>2535.00</b>	0.004	0.000	-0.0023	0.0054	<b>5.09</b>	1.46
3-OS	<b>2.15</b>	<b>0.034</b>	0.375	0.0012	0.0137	6.33	<b>2.39</b>
3-US	<b>1.65</b>	-0.003	0.000	-0.0024	0.0051	<b>4.07</b>	0.91
3b-OS	-0.04	-0.000	0.014	-0.0016	0.0013	6.88	0.56
3b-US	-0.18	-0.004	0.216	-0.0026	0.0060	<b>8.60</b>	<b>2.04</b>
4-OS	<b>5.14</b>	<b>0.115</b>	0.009	0.0004	0.0229	<b>22.14</b>	1.22
4-US	<b>7.70</b>	<b>0.034</b>	0.293	0.0025	<b>0.0114</b>	<b>7.53</b>	0.14
5-OS	ND	ND	ND	ND	ND	ND	ND
5-US	<b>1820.00</b>	<b>0.070</b>	0.104	<b>0.0310</b>	0.0086	<b>4.37</b>	0.76
6b-OS	0.61	<b>0.275</b>	0.029	0.0127	<b>0.1925</b>	7.49	0.82
6b-US	0.40	<b>0.071</b>	0.000	<b>0.0091</b>	<b>0.1279</b>	<b>5.94</b>	1.24
7a-OS	ND	ND	ND	ND	ND	ND	ND
7a-US	<b>8.00</b>	0.005	0.000	0.0002	0.0060	1.83	1.08
7b-OS	ND	ND	ND	ND	ND	ND	ND
7b-US	<b>4.80</b>	-0.002	0.000	0.0013	0.0026	1.03	0.60
7c-OS	<b>3.78</b>	<b>0.019</b>	0.000	0.0003	0.0126	6.73	1.55
7c-US	<b>3.77</b>	<b>0.024</b>	0.000	<b>0.0201</b>	<b>0.0599</b>	<b>6.39</b>	1.01
8-OS	0.05	-0.002	0.000	0.0005	0.0033	5.47	0.71
8-US	-0.01	0.001	0.000	-0.0006	0.0013	2.51	0.73
BG-OS	-0.11	-0.000	0.156	0.0002	0.0086	9.13	0.52
BG-US	0.40	0.004	0.324	-0.0012	<b>0.0120</b>	3.47	<b>1.94</b>
RSRL-OS <sup>3</sup>	1.9	0.017	1.7	0.038	0.075	17.09	1.6
RSRL-US	1.6	0.010	0.94	0.005	0.011	3.8	1.5

<sup>1</sup> Sample locations listed in Table 1, and BG = background (south and upwind of LANL). Sample type: OS is overstory vegetation (trees), US is understory vegetation (grasses/forbs).

<sup>2</sup> Concentration for <sup>3</sup>H is based on moisture in vegetation.

<sup>3</sup> Regional Statistical Reference Level; this is the upper (95%) level background concentration (mean + 2 std dev) from 1994-1997.

the 14 samples assayed (Table 4). As in previous years,  $^3\text{H}$  concentrations in overstory and understory vegetation collected outside of Area G and adjacent to the  $^3\text{H}$  shafts (locations 1 and 2) were greater than background concentrations. Vegetation samples collected adjacent to the TRU waste pad (location 5) and outside of Area G immediately north of the TRU waste pad (location 4) also exhibited elevated  $^3\text{H}$  concentrations. The  $^3\text{H}$  concentrations in understory vegetation samples collected above Pits 17 and 18 (location 7a) and above Pit 7 (location 7b) were also greater than background concentrations.

The concentrations of  $^{238}\text{Pu}$  and  $^{239,240}\text{Pu}$  in vegetation ranged from undetectable to  $0.0201 \text{ pCi g}^{-1}$  ash for  $^{238}\text{Pu}$  and from 0.001 to 0.193 for  $^{239,240}\text{Pu}$  (Table 4). The plutonium concentrations of overstory and understory samples collected from locations 6b and 7c were greater than in background samples. In fact, the  $^{238}\text{Pu}$  and  $^{239,240}\text{Pu}$  concentrations of the understory samples at both of these locations were above RSRL concentrations, as was the  $^{239,240}\text{Pu}$  concentrations for the overstory sample collected at location 6b. These data correlated well with the soil plutonium

concentrations and elevated plutonium ratios presented previously (Figure 7), which was to be expected since the samples were collected near the TRU pads and Pits 8, 9, 10, 12, 13, 15, and 16.

The concentrations of  $^{241}\text{Am}$  in the understory and overstory samples collected at Area G ranged from undetectable to  $0.275 \text{ pCi g}^{-1}$  ash (Table 4). Just as with  $^{238}\text{Pu}$  and  $^{239,240}\text{Pu}$  concentrations,  $^{241}\text{Am}$  concentrations in both overstory and understory samples collected at stations 6b and 7c were above RSRL concentrations. However, the samples collected on top of TRU Waste Pad #2 (location 5) and the location immediately north and outside the Area G fence (location 4) also exhibited above RSRL concentrations of  $^{241}\text{Am}$  (Table 4). Unlike the data discussed for plutonium isotopes, both the overstory and understory samples collected at location 4 were also above RSRL concentrations of  $^{241}\text{Am}$ .

Unlike the  $^{90}\text{Sr}$  data for the soils collected at Area G, most of the understory samples, but very few of the overstory samples, assayed for  $^{90}\text{Sr}$  were above RSRL concentrations, regardless if the samples were collected inside or outside of Area G (Tables 1 and 4). The

$^{90}\text{Sr}$  concentrations in these vegetation samples ranged from 1.03 to 22.14 pCi g<sup>-1</sup> ash (Table 4). Understory vegetation samples collected at stations 1, 3b, and 5 contained elevated  $^{90}\text{Sr}$  concentrations (Table 4), even though  $^{90}\text{Sr}$  was not detected in the corresponding soil samples at these locations (Table 2). This could reflect understory root uptake of  $^{90}\text{Sr}$  from soil depths beneath our soil sampling zone.

Most of the concentrations of  $^{238}\text{U}$  and  $^{137}\text{Cs}$  found in the overstory and understory vegetation samples collected at Area G were below background and RSRL concentrations (Table 4). This finding agrees with previous monitoring results at Area G (Fresquez et al., 1999).

The 1999 monitoring data and the statistics compiled from 1994 through 1998 (Fresquez et al., 1999) suggest that Area G operations have impacted the soils and vegetation at the sampling locations, but the magnitude of the impact has been minimal and not of concern to human health.

#### **IV. ACKNOWLEDGMENTS**

Thanks to the 1999 field crew (L. Naranjo, Jr., Marquis Childs, Michael Ebinger, David Lujan, and Adrian Martinez) for sample collection and processing. Also, special thanks to Andi Kron for figure construction, to Teresa Hiteman and Carolyn Hedrick for final report preparation, and to Hector Hinojosa for editing the manuscript.



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## **APPENDIX A**

### **CST-9 ANALYTICAL REPORTS OF RADIONUCLIDES IN SOIL SURFACE SAMPLES AT AREA G**



**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Phil Fresquez / M887*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: September 13, 1999*

This is a Case Narrative for the following:

**Submission ID: 100039019**  
**Analysis: Tritium Analysis is Water**

#### **I. Introduction**

On July 14, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

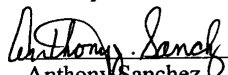
The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC355, R.1.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

#### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package.

 9/13/99  
Anthony Sanchez

00008

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102506	300223794	SITE3 ✓	H-3	1540 ✓	710	pCi/L	
			H-3 MDA	410		pCi/L	
200102513	300223801	SITE5 ✓	H-3	13300 ✓	1300	pCi/L	
			H-3 MDA	400		pCi/L	
200102514	300223808	SITE7A ✓	H-3	3950 ✓	860	pCi/L	
			H-3 MDA	410		pCi/L	
200102515	300223814	SITE7B ✓	H-3	3410 ✓	830	pCi/L	
			H-3 MDA	420		pCi/L	
200102516	300223822	SITE7C ✓	H-3	2240 ✓	760	pCi/L	
			H-3 MDA	410		pCi/L	
200102517	300223829	SITE4 ✓	H-3	1910 ✓	740	pCi/L	
			H-3 MDA	420		pCi/L	
200102518	300223836	SITE6B ✓	H-3	530 ✓	650	pCi/L	
			H-3 MDA	410		pCi/L	
200102519	300223843	SITE1	H-3	65100 ✓	3100	pCi/L	
			H-3 MDA	400		pCi/L	
200102520	300223849	SITE2 ✓	H-3	81900 ✓	3600	pCi/L	
			H-3 MDA	400		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102521	300223857	SITE3B -	H-3	80 ✓	610	pCi/L	
			H-3 MDA	410		pCi/L	
200102522	300223864	SITE8 ✓	H-3 ✓	130 ✓	620	pCi/L	
			H-3 MDA	410		pCi/L	
200102523	300223871	SITE9 ✓	H-3	130	620	pCi/L	
			H-3 MDA	420		pCi/L	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102514	300223808		H-3	3950	860	pCi/L	
			H-3 MDA	410		pCi/L	
200108468	300233987	300223808	H-3	3820	850	pCi/L	
			H-3 MDA	410		pCi/L	

00010

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200102530	300223882	H-3	13600	1300	pCi/L	17370	452	pCi/L	WARNING 2-3SIG

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41368	300233985	H-3	-0.00007	0.00060	uCi/L	0	0	uCi/L	IN CONTROL
00.41372	300233986	H-3	0.0111	0.0012	uCi/L	0.01352	0.001352	uCi/L	IN CONTROL
00.41368	300233988	H-3	-0.00001	0.00059	uCi/L	0	0	uCi/L	IN CONTROL
00.41372	300233989	H-3	0.0115	0.0012	uCi/L	0.01352	0.001352	uCi/L	IN CONTROL

00011

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

*lip*  
Analyst

*STG*  
Review

*OS*  
Team Leader

*AKL*  
QA Officer

9/12/99  
Date

9/15/99  
Date

9/16/99  
Date

9/17/99  
Date

00012

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

COPY

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Marquis Childs / MS K490*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: January 14, 2000*

This is a Case Narrative for the following:

**Submission ID: 100037772**  
**Analysis: Tritium Analysis in Soil**

#### **I. Introduction**

On May 10, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC335, R.0.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

#### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. Sample 200097930(blind QC), was re-submitted and re-analysis, result value is still low, as it was the first initial count, enough liquid was still available to do a re-analysis. I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

*Anthony Sanchez 1/14/2000*  
Anthony Sanchez

*replacement for page 7. @ 1/14/2000*

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096912	300214633	G-45-07	H-3	6800	1000	pCi/L	8000
			H-3 MDA	400		pCi/L	
200096914	300214638	G-45-01	H-3	7900	1100	pCi/L	
			H-3 MDA	400		pCi/L	
200096915	300214643	G-45-06	H-3	4270	890	pCi/L	
			H-3 MDA	440		pCi/L	
200096916	300214648	G-44-01	H-3	3970	870	pCi/L	
			H-3 MDA	440		pCi/L	
200096917	300214649	G-45-05	H-3	650	670	pCi/L	
			H-3 MDA	440		pCi/L	
200096918	300214658	G-45-04	H-3	1690	740	pCi/L	
			H-3 MDA	440		pCi/L	
200096919	300214663	G-44-07	H-3	620	670	pCi/L	
			H-3 MDA	440		pCi/L	
200096920	300214668	G-43-01	H-3	910	690	pCi/L	
			H-3 MDA	440		pCi/L	
200096921	300214673	G-42-06	H-3	1710	740	pCi/L	
			H-3 MDA	440		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096922	300214678	G-41-02	H-3	670	680	pCi/L	
			H-3 MDA	440		pCi/L	
200096923	300214680	G-40-02	H-3	680	680	pCi/L	
			H-3 MDA	440		pCi/L	
200096924	300214688	G-40-01	H-3	980	700	pCi/L	
			H-3 MDA	440		pCi/L	
200096925	300214693	G-42-01	H-3	1570	730	pCi/L	
			H-3 MDA	440		pCi/L	
200096926	300214695	G-39-01	H-3	410	660	pCi/L	
			H-3 MDA	430		pCi/L	
200096927	300214703	G-39-02	H-3	760	680	pCi/L	
			H-3 MDA	430		pCi/L	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096924	300214688		H-3	980	700	pCi/L	
			H-3 MDA	440		pCi/L	
200101246	300222078	300214688	H-3	640	670	pCi/L	
			H-3 MDA	440		pCi/L	

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\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200096930	300214707	H-3	12800	1300	pCi/L	17860	464	pCi/L	OUT OF CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41368	300222076	H-3	0.00027	0.00065	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300222077	H-3	0.0118	0.0012	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL
00.41368	300222079	H-3	0.00018	0.00064	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300222080	H-3	0.0121	0.0013	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL


0010

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

  
Analyst

  
Review

  
Team Leader

  
QA Officer

7/13/99  
Date

7/14/99  
Date

7/23/99  
Date

7/26/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

0011

# COPY

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Marquis Childs / MS K490*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: June 17, 1999*

This is a Case Narrative for the following:

**Submission ID: 100037835**  
**Analysis: Tritium Analysis in Soil**

## **I. Introduction**

On May 12, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

## **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC335, R.0.

## **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

## **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

 6/17/99  
Anthony Sanchez

17-Jun-1999 14:20

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Page 1 of 4

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	15-JUL-99
Requester Group:	ESH-19	Logged Date:	12-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097228	300215260	38-02	H-3	2380 ✓	780	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200097231	300215265	29-01	H-3	13800 ✓	1300	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097232	300215270	29-02	H-3	24900 ✓	1800	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097233	300215275	29-03	H-3	226500 ✓	7600	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097234	300215280	30-01	H-3	69900 ✓	3200	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097235	300215285	31-01	H-3	32100 ✓	2000	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097236	300215290	31-02	H-3	16300 ✓	1400	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097237	300215295	31-03	H-3	10200 ✓	1200	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200097238	300215300	32-01	H-3	11300 ✓	1200	pCi/L	
			H-3 MDA	400 ✓		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

007

17-Jun-1999 14:20

Page 2 of 4

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097239	300215305	32-02	H-3	4880 ✓	920	pCi/L	
			H-3 MDA	430		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

008

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200097241	300215310	H-3	9200	1100	pCi/L	11370	295	pCi/L	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41368	300218940	H-3	0.00019	0.00064	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300218941	H-3	0.0121	0.0013	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL
00.41368	300218942	H-3	0.00012	0.00064	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300218943	H-3	0.0122	0.0013	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL

600

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

*Ajp*  
Analyst

*STG*  
Review

*GB*  
Team Leader

*NK for PCL*  
QA Officer

6/17/99  
Date

6/18/99  
Date

6/18/99  
Date

6/22/99  
Date

C  
1  
C

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Marquis Childs / MS K490*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: July 26, 1999*

This is a Case Narrative for the following:

**Submission ID:** 100037770  
**Analysis:** *Generic Moisture in Soil*

#### **I. Introduction**

On May 10, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC335, R.0.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

#### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. Sample 200097930 (blind QC), was re-submitted and re-analysis, result value is still low, as it was the first initial count, enough liquid was still available to do a re-analysis. I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

 7/26/99  
Anthony Sanchez

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096912	300214633	G-45-07 ✓	H-3	6800	1000	pCi/L	
			H-3 MDA	400		pCi/L	
200096914	300214638	G-45-01 ✓	H-3	7900	1100	pCi/L	
			H-3 MDA	400		pCi/L	
200096915	300214643	G-45-06 ✓	H-3	4270	890	pCi/L	
			H-3 MDA	440		pCi/L	
200096916	300214648	G-44-01 ✓	H-3	3970	870	pCi/L	
			H-3 MDA	440		pCi/L	
200096917	300214649	G-45-05 ✓	H-3	650	670	pCi/L	
			H-3 MDA	440		pCi/L	
200096918	300214658	G-45-04 ✓	H-3	1690	740	pCi/L	
			H-3 MDA	440		pCi/L	
200096919	300214663	G-44-07 ✓	H-3	620	670	pCi/L	
			H-3 MDA	440		pCi/L	
200096920	300214668	G-43-01 ✓	H-3	910	690	pCi/L	
			H-3 MDA	440		pCi/L	
200096921	300214673	G-42-06 ✓	H-3	1710	740	pCi/L	
			H-3 MDA	440		pCi/L	

8000

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096922	300214678	G-41-02 ✓	H-3	670	680	pCi/L	
			H-3 MDA	440		pCi/L	
200096923	300214680	G-40-02 ✓	H-3	680	680	pCi/L	
			H-3 MDA	440		pCi/L	
200096924	300214688	G-40-01 ✓	H-3	980	700	pCi/L	
			H-3 MDA	440		pCi/L	
200096925	300214693	G-42-01 ✓	H-3	1570	730	pCi/L	
			H-3 MDA	440		pCi/L	
200096926	300214695	G-39-01 ✓	H-3	410	660	pCi/L	
			H-3 MDA	430		pCi/L	
200096927	300214703	G-39-02 ✓	H-3	760	680	pCi/L	
			H-3 MDA	430		pCi/L	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096924	300214688		H-3	980	700	pCi/L	
			H-3 MDA	440		pCi/L	
200101246	300222078	300214688	H-3	640	670	pCi/L	
			H-3 MDA	440		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200096930	300214707	H-3	12800	1300	pCi/L	17860	464	pCi/L	OUT OF CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41368	300222076	H-3	0.00027	0.00065	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300222077	H-3	0.0118	0.0012	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL
00.41368	300222079	H-3	0.00018	0.00064	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300222080	H-3	0.0121	0.0013	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL

0010

\*\*\*\* FINAL REPORT \*\*\*\*

07-Jul-1999 06:39

Page 4 of 4

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

*lip*  
Analyst

*STB*  
Review

*DS*  
Team Leader

*PL*  
QA Officer

7/13/99  
Date

7/14/99  
Date

7/23/99  
Date

7/26/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

0011

# COPY

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Marquis Childs / MS K490*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: June 23, 1999*

This is a Case Narrative for the following:

**Submission ID: 100037770**  
**Analysis: Tritium Analysis in Soil**

### **I. Introduction**

On May 10, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC335, R.O.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

 6/23/99  
Anthony Sanchez

0008

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096888	300214548	G-34-15	H-3	710 / ✓	680	pCi/L	
			H-3 MDA	440		pCi/L	
200096889	300214553	G-34-09	H-3	140 ✓	640	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096890	300214557	G-49-01	H-3	780 ✓	680	pCi/L	
			H-3 MDA	450 ✓		pCi/L	
200096891	300214563	G-34-10	H-3	150 ✓	640	pCi/L	
			H-3 MDA	450 ✓		pCi/L	
200096892	300214568	G-34-07	H-3	170 ✓	640	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096893	300214573	G-49-04	H-3	530 ✓	670	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096894	300214578	G-48-02	H-3	150 ✓	640	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096895	300214580	G-46-02	H-3	1240 ✓	710	pCi/L	
			H-3 MDA	450 ✓		pCi/L	
200096896	300214588	G-50-01	H-3	550 ✓	670	pCi/L	
			H-3 MDA	450		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096897	300214593	G-47-01	H-3	420 ✓	660	pCi/L	
			H-3 MDA	450 ✓		pCi/L	
200096898	300214598	G-34-05	H-3	270 ✓	650	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096899	300214603	G-50-02	H-3	830 ✓	690	pCi/L	
			H-3 MDA	450 ✓		pCi/L	
200096900	300214608	G-58-01	H-3	470 ✓	660	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096901	300214613	G-46-01	H-3	1200 ✓	710	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200096902	300214618	G-52-03	H-3	170 ✓	640	pCi/L	
			H-3 MDA	440 ✓		pCi/L	

0010

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200096931	300214711	H-3	4660	910	pCi/L	6700	174	pCi/L	WARNING 2-3SIG
200096932	300214713	H-3	7000	1000	pCi/L	8930	232	pCi/L	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41368	300220248	H-3	-0.00007	0.00063	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300220249	H-3	0.0113	0.0012	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL
00.41368	300220250	H-3	0.00012	0.00064	uCi/L	0	0	uCi/L	IN CONTROL
00.41370	300220251	H-3	0.0116	0.0012	uCi/L	0.0139	0.00139	uCi/L	IN CONTROL

0011

\*\*\*\* FINAL REPORT \*\*\*\*

23-Jun-1999 12:32

Page 4 of 4

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

*[Signature]*  
Analyst

*[Signature]*  
Review

*[Signature]*  
Team Leader

*NK/m PCL*  
QA Officer

6/23/99  
Date

6/24/99  
Date

6/24/99  
Date

6/24/99  
Date

0012

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Analytical Chemistry Sciences  
Los Alamos, New Mexico 87545

To/MS: Files  
From/MS: Steve Goldstein, K484  
Phone/FAX: 5-4793/5-5982  
Symbol:  
Date: March 7, 2000

This is a Case Narrative for the following:

**Submission ID** : 100039019  
**Analysis** : Pu in Environmental Matrices – Alpha Spectroscopy

### **I. Introduction**

On July 14, 1999, a set of soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Plutonium In Environmental Matrices - Alpha Spectroscopy. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC331, R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

These data have recoveries in the range of 30-100%. All the QC parameters appear to be fine for these data. No anomalies are found.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Steve Goldstein

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: PU RAS ENV Method Area: EH-ALPHA Submission Id : 100039019

Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200102506	300223792	SITE3	Pu-238	0.0118 ✓	0.0029	pCi/g	
			Pu-238 DL	0.0069 ✓		pCi/g	
			Pu-239	0.0458 ✓	0.0051	pCi/g	
			Pu-239 DL	0.0049		pCi/g	
			Pu-242T Recovery	34.89		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.78		%	
200102513	300223799	SITE5	Pu-238	0.0024 ✓	0.0010	pCi/g	
			Pu-238 DL	0.0024 ✓		pCi/g	
			Pu-239	0.0134 ✓	0.0023	pCi/g	
			Pu-239 DL	0.0035		pCi/g	
			Pu-242T Recovery	49.59		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

9

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102513	300223799	SITE5	Count Time	1333.33		min	
			Efficiency	19.55		%	
200102514	300223806	SITE7A	Pu-238	0.0050 ✓	0.0018	pCi/g	
			Pu-238 DL	0.0049		pCi/g	
			Pu-239	0.0118 ✓	0.0023	pCi/g	
			Pu-239 DL	0.0030		pCi/g	
			Pu-242T Recovery	31.09		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	26.11		%	
200102515	300223812	SITE7B	Pu-238	0.0354 ✓	0.0043	pCi/g	
			Pu-238 DL	0.0051 ✓		pCi/g	
			Pu-239	0.0268 ✓	0.0037	pCi/g	
			Pu-239 DL	0.0032		pCi/g	
			Pu-242T Recovery	35.33		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.79		%	
200102516	300223820	SITE7C	Pu-238	0.0909 ✓	0.0079	pCi/g	
			Pu-238 DL	0.0037 ✓		pCi/g	
			Pu-239	1.0146 ✓	0.0455	pCi/g	
			Pu-239 DL	0.0058		pCi/g	
			Pu-242T Recovery	30.35		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	

\*\*\*\* FINAL REPORT \*\*\*\*

10

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102516	300223820	SITE7C	Efficiency	20.59		%	
200102517	300223827	SITE4	Pu-238	0.3643	0.0169	pCi/g	
			Pu-238 DL	0.0031		pCi/g	
			Pu-239	0.7752	0.0309	pCi/g	
			Pu-239 DL	0.0029		pCi/g	
			Pu-242T Recovery	44.38		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.15		%	
200102518	300223834	SITE6B	Pu-238	0.0139	0.0030	pCi/g	
			Pu-238 DL	0.0053		pCi/g	
			Pu-239	0.3335	0.0184	pCi/g	
			Pu-239 DL	0.0071		pCi/g	
			Pu-242T Recovery	31.88		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.12		%	
200102519	300223841	SITE1	Pu-238	0.0145	0.0027	pCi/g	
			Pu-238 DL	0.0026		pCi/g	
			Pu-239	0.0401	0.0046	pCi/g	
			Pu-239 DL	0.0026		pCi/g	
			Pu-242T Recovery	36.72		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.40		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200102520	300223847	SITE2	Pu-238	0.0056 ✓	0.0024	pCi/g	
			Pu-238 DL	0.0073 ✓		pCi/g	
			Pu-239	0.0270 ✓	0.0037	pCi/g	
			Pu-239 DL	0.0036		pCi/g	
			Pu-242T Recovery	37.95		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.01		%	
200102521	300223855	SITE3B	Pu-238	0.0016 ✓	0.0013	pCi/g	
			Pu-238 DL	0.0039 ✓		pCi/g	
			Pu-239	0.0160 ✓	0.0029	pCi/g	
			Pu-239 DL	0.0026		pCi/g	
			Pu-242T Recovery	36.18		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.07		%	
200102522	300223862	SITE8	Pu-238	0.0091 ✓	0.0023	pCi/g	
			Pu-238 DL	0.0041 ✓		pCi/g	
			Pu-239	0.0202 ✓	0.0035	pCi/g	
			Pu-239 DL	0.0055		pCi/g	
			Pu-242T Recovery	30.50		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	21.70		%	
200102523	300223869	SITE9	Pu-238	-0.0002	0.0007	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

12

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223869	SITE9	Pu-238 DL	0.0038		pCi/g	
			Pu-239	0.0204	0.0032	pCi/g	
			Pu-239 DL	0.0038		pCi/g	
			Pu-242T Recovery	37.31		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.75		%	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223869		Pu-238	-0.0002	0.0007	pCi/g	
			Pu-238 DL	0.0038		pCi/g	
			Pu-239	0.0204	0.0032	pCi/g	
			Pu-239 DL	0.0038		pCi/g	
			Pu-242T Recovery	37.31		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.75		%	
200123608	300259537	300223869	Pu-238	0.0002	0.0010	pCi/g	
			Pu-238 DL	0.0047		pCi/g	
			Pu-239	0.0140	0.0027	pCi/g	
			Pu-239 DL	0.0032		pCi/g	
			Pu-242T Recovery	35.65		%	
			Analysis Date	29-FEB-2000		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

13

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200123608	300259537	300223869	Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.24		%	

\*\*\*\* FINAL REPORT \*\*\*\*

14

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
200102527	300223877	Pu-238	0.1880	0.0094	pCi/g	0.206	0.007	pCi/g	IN CONTROL
		Pu-239	0.0990	0.0062	pCi/g	0.108	0.003	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22776	300259538	Pu-238	0.0004	0.0003	pCi/g	0.0	0.0	pCi/g	IN CONTROL
		Pu-239	0.0017	0.0006	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG

\*\*\*\* FINAL REPORT \*\*\*\*

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07-Mar-2000 13:21

Page 8 of 8

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Al Bualie  
Analyst

SB  
Review

GO  
Team Leader

PL  
QA Officer

3/7/00  
Date

3/7/00  
Date

3/8/00  
Date

3/8/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

16

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES		
Requester Phone:	665-9442			Logged by:	LBRANCH
Requester Fax #:		Analytical Service Agreement #:			

## CUSTOMER SAMPLES

OK 4/5/99

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096912	300214629	G-45-07 ✓	Pu-238 ✓	3.2794 ✓	0.1201	pCi/g	
			Pu-238 DL	0.0090 ✓		pCi/g	
			Pu-239 ✓	0.5243 ✓	0.0236	pCi/g	
			Pu-239 DL	0.0047		pCi/g	
			Pu-242T Recovery	40.06		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.86		%	
200096914	300214634	G-45-01 ✓	Pu-238 ✓	0.4393 ✓	0.0185	pCi/g	
			Pu-238 DL	0.0041 ✓		pCi/g	
			Pu-239 ✓	0.4946 ✓	0.0204	pCi/g	
			Pu-239 DL	0.0036		pCi/g	
			Pu-242T Recovery	50.84		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096914	300214634	G-45-01	Count Time	1333.33		min	
			Efficiency	19.64		%	
200096915	300214639	G-45-06 /	Pu-238 ✓	0.2253 ✓	0.0127	pCi/g	
			Pu-238 DL	0.0036 ✓		pCi/g	
			Pu-239 ✓	0.1526	0.0098	pCi/g	
			Pu-239 DL	0.0030		pCi/g	
			Pu-242T Recovery	39.97		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.35		%	
200096916	300214644	G-44-01 /	Pu-238 ✓	0.4445 ✓✓	0.0168	pCi/g	
			Pu-238 DL	0.0013		pCi/g	
			Pu-239 ✓	0.3717 ✓✓	0.0146	pCi/g	
			Pu-239 DL	0.0023		pCi/g	
			Pu-242T Recovery	48.50		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	26.48		%	
200096917	300214650	G-45-05 /	Pu-238 ✓	0.7444 ✓✓	0.0298	pCi/g	
			Pu-238 DL	0.0026		pCi/g	
			Pu-239 ✓	0.8940 ✓✓	0.0348	pCi/g	
			Pu-239 DL	0.0021		pCi/g	
			Pu-242T Recovery	43.34		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096917	300214650	G-45-05	Efficiency	20.69		%	
200096918	300214654	G-45-04 ✓	Pu-238 ✓	0.3224 ✓	0.0165	pCi/g	
			Pu-238 DL	0.0040 ✓		pCi/g	
			Pu-239 ✓	0.2781 ✓	0.0148	pCi/g	
			Pu-239 DL	0.0032		pCi/g	
			Pu-242T Recovery	37.50		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.42		%	
200096919	300214659	G-44-07 ✓	Pu-238 ✓	0.0502 ✓	0.0050	pCi/g	
			Pu-238 DL	0.0066		pCi/g	
			Pu-239 ✓	0.1478 ✓	0.0092	pCi/g	
			Pu-239 DL	0.0043		pCi/g	
			Pu-242T Recovery	41.58		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.19		%	
200096920	300214664	G-43-01 ✓	Pu-238 ✓	0.5714 ✓	0.0229	pCi/g	
			Pu-238 DL	0.0019		pCi/g	
			Pu-239 ✓	4.2601 ✓	0.1408	pCi/g	
			Pu-239 DL	0.0017		pCi/g	
			Pu-242T Recovery	50.65		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	19.60		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096921	300214669	G-42-06 ✓	Pu-238 ✓	0.0551 ✓	0.0044	pCi/g	
			Pu-238 DL	0.0024		pCi/g	
			Pu-239 ✓	0.2953 ✓		pCi/g	
			Pu-239 DL	0.0027		pCi/g	
			Pu-242T Recovery	57.10		%	
			Analysis Date	23-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	20.14		%	
200096922	300214674	G-41-02 ✓	Pu-238 ✓	0.8692 ✓ ✓	0.0347	pCi/g	
			Pu-238 DL	0.0032		pCi/g	
			Pu-239 ✓	0.3134 ✓		pCi/g	
			Pu-239 DL	0.0028		pCi/g	
			Pu-242T Recovery	40.07		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	21.37		%	
200096923	300214681	G-40-02 ✓	Pu-238 ✓	0.0788 ✓ ✓	0.0051	pCi/g	
			Pu-238 DL	0.0033		pCi/g	
			Pu-239 ✓	0.1637 ✓		pCi/g	
			Pu-239 DL	0.0025		pCi/g	
			Pu-242T Recovery	66.74		%	
			Analysis Date	06-OCT-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	19.85		%	
200096924	300214684	G-40-01 ✓	Pu-238 ✓	0.2940 ✓	0.0133	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

4/5/00

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096924	300214684	G-40-01 ✓	Pu-238 DL	0.0027 ✓	0.0197	pCi/g	
			Pu-239	0.4886 ✓		pCi/g	
			Pu-239 DL	0.0027		pCi/g	
			Pu-242T Recovery	46.97		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	22.43		%	
			200096925	300214689		G-42-01 ✓	Pu-238
Pu-238 DL	0.0019	pCi/g					
Pu-239	0.2056 ✓	pCi/g					
Pu-239 DL	0.0021	pCi/g					
Pu-242T Recovery	66.46	%					
Analysis Date	06-OCT-1999	DD-MON-YYYY					
Instrument	80 ALPHA	NONE					
Problem Code	OK	NONE					
Count Time	1333.33	min					
Efficiency	19.37	%					
200096926	300214696	G-39-01 ✓	Pu-238	0.9189 ✓	0.0296	pCi/g	
			Pu-238 DL	0.0018		pCi/g	
			Pu-239	0.5573 ✓		pCi/g	
			Pu-239 DL	0.0024		pCi/g	
			Pu-242T Recovery	69.22		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	20.43		%	
200096927	300214699	G-39-02 ✓	Pu-238	0.0845 ✓	0.0053	pCi/g	
			Pu-238 DL	0.0037		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

✓

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037772

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096927	300214699	G-39-02	Pu-239	0.1794 ✓	0.0086	pCi/g	
			Pu-239 DL	0.0021		pCi/g	
			Pu-242T Recovery	49.76		%	
			Analysis Date	06-OCT-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	25.97		%	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096927	300214699		Pu-238	0.0845	0.0053	pCi/g	
			Pu-238 DL	0.0037		pCi/g	
			Pu-239	0.1794	0.0086	pCi/g	
			Pu-239 DL	0.0021		pCi/g	
			Pu-242T Recovery	49.76		%	
			Analysis Date	06-OCT-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	25.97		%	
200108661	300234483	300214699	Pu-238	0.5971	0.0219	pCi/g	
			Pu-239	0.1804	0.0089	pCi/g	
			Pu-242T Recovery	55.03		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

13

Method: PU RAS ENV Method Area: EH-ALPHA Submission Id : 100037772

\*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
200096928	300214704	Pu-238	0.1808	0.0114	pCi/g	0.206	0.007	pCi/g	IN CONTROL
		Pu-239	0.1179	0.0086	pCi/g	0.108	0.003	pCi/g	IN CONTROL

METHOD BLANK

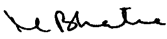
<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22776	300234484	Pu-238	0.0012	0.0006	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG
		Pu-239	0.0009	0.0004	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG

\*\*\*\* FINAL REPORT \*\*\*\*


Method: PU RAS ENV


Method Area: EH-ALPHA

Submission Id : 100037772

  
Analyst

  
Review

  
Team Leader

  
QA Officer

11.18.99  
Date

11/19/99  
Date

11/24/99  
Date

11/29/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

Requester Name:	MARUQIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096888	300214544	G-34-15 ✓	Pu-238 ✓	0.2147 ✓	0.0093	pCi/g	
			Pu-238 DL	0.0013 ✓		pCi/g	
			Pu-239 ✓	0.0718 ✓	0.0046	pCi/g	
			Pu-239 DL	0.0018		pCi/g	
			Pu-242T Recovery	51.58		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	27.53		%	
200096889	300214549	G-34-09 ✓	Pu-238 ✓	0.0046 ✓	0.0026	pCi/g	
			Pu-238 DL	0.0104 ✓		pCi/g	
			Pu-239 ✓	0.0346 ✓	0.0044	pCi/g	
			Pu-239 DL	0.0053		pCi/g	
			Pu-242T Recovery	36.21		%	
			Analysis Date	05-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096889	300214549	G-34-09	Count Time	1333.33		min	
			Efficiency	20.07		%	
200096890	300214558	G-49-01 ✓	Pu-238 ✓	0.0346 ✓	0.0040	pCi/g	
			Pu-238 DL	0.0071		pCi/g	
			Pu-239 ✓	0.3796 ✓	0.0171	pCi/g	
			Pu-239 DL	0.0046		pCi/g	
			Pu-242T Recovery	48.00		%	
			Analysis Date	05-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.31		%	
200096891	300214559	G-34-10 ✓	Pu-238 ✓	0.0391 ✓	0.0035	pCi/g	
			Pu-238 DL	0.0020 ✓		pCi/g	
			Pu-239 ✓	1.6797 ✓	0.0539	pCi/g	
			Pu-239 DL	0.0023		pCi/g	
			Pu-242T Recovery	50.81		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	24.02		%	
200096892	300214564	G-34-07 ✓	Pu-238 ✓	0.0054 ✓	0.0018	pCi/g	
			Pu-238 DL	0.0065		pCi/g	
			Pu-239 ✓	0.2934 ✓	0.0130	pCi/g	
			Pu-239 DL	0.0048		pCi/g	
			Pu-242T Recovery	42.38		%	
			Analysis Date	05-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096892	300214564	G-34-07	Efficiency	26.64		%	
200096893	300214569	G-49-04 ✓	Pu-238 ✓	0.0122 ✓	0.0018	pCi/g	
			Pu-238 DL	0.0043		pCi/g	
			Pu-239 ✓	0.0525 ✓	0.0035	pCi/g	
			Pu-239 DL	0.0039		pCi/g	
			Pu-242T Recovery	86.69		%	
			Analysis Date	05-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	20.70		%	
200096894	300214574	G-48-02 ✓	Pu-238 ✓	0.0165 ✓	0.0030	pCi/g	
			Pu-238 DL	0.0043		pCi/g	
			Pu-239 ✓	0.2219 ✓	0.0131	pCi/g	
			Pu-239 DL	0.0062		pCi/g	
			Pu-242T Recovery	34.91		%	
			Analysis Date	05-AUG-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.43		%	
200096895	300214581	G-46-02 ✓	Pu-238 ✓	0.2618 ✓	0.0116	pCi/g	
			Pu-238 DL	0.0016		pCi/g	
			Pu-239 ✓	0.2837 ✓	0.0123	pCi/g	
			Pu-239 DL	0.0019		pCi/g	
			Pu-242T Recovery	45.92		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	26.20		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096896	300214584	G-50-01 ✓	Pu-238 ✓	0.0149 ✓	0.0029	pCi/g	
			Pu-239 ✓	0.0732 ✓	0.0069	pCi/g	
			Pu-242T Recovery	33.69		%	
			Analysis Date	05-NOV-1999		DD-MON-YYYY	
200096897	300214589	G-47-01 ✓	Pu-238 ✓	0.0008 ✓	0.0005	pCi/g	
			Pu-238 DL	0.0014		pCi/g	
			Pu-239 ✓	0.1743 ✓	0.0076	pCi/g	
			Pu-239 DL	0.0017		pCi/g	
			Pu-242T Recovery	62.37		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	OK		NONE	
200096898	300214594	G-34-05 ✓	Count Time	1333.33		min	
			Efficiency	26.04 ✓		%	
			Pu-238 ✓	0.0204 ✓	0.0029	pCi/g	
			Pu-238 DL	0.0031		pCi/g	
			Pu-239 ✓	0.0785 ✓	0.0059	pCi/g	
			Pu-239 DL	0.0025		pCi/g	
			Pu-242T Recovery	45.40		%	
			Analysis Date	02-NOV-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
200096899	300214599	G-50-02 ✓	Count Time	1333.33		min	
			Efficiency	20.78		%	
			Pu-238 ✓	0.0530 ✓	0.0053	pCi/g	
			Pu-238 DL	0.0041 ✓		pCi/g	
			Pu-239 ✓	0.1063 ✓	0.0080	pCi/g	
			Pu-239 DL	0.0025		pCi/g	
			Pu-242T Recovery	37.67		%	
			Analysis Date	02-NOV-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096899	300214599	G-50-02	Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.60		%	
200096900	300214604	G-58-01 ✓	Pu-238 ✓	0.0842 ✓✓	0.0071	pCi/g	
			Pu-238 DL	0.0055		pCi/g	
			Pu-239 ✓	0.0430 ✓✓	0.0048	pCi/g	
			Pu-239 DL	0.0042		pCi/g	
			Pu-242T Recovery	35.61		%	
			Analysis Date	02-NOV-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.27		%	
200096901	300214609	G-46-01 ✓	Pu-238	0.0051 ✓✓	0.0015	pCi/g	
			Pu-238 DL	0.0021		pCi/g	
			Pu-239 ✓	1.597 ✓✓	0.061	pCi/g	
			Pu-239 DL	0.0034		pCi/g	
			Pu-242T Recovery	29.03		%	
			Analysis Date	12-AUG-1999		DD-MON-YYYY	
			Instrument	64 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	28.11		%	
200096902	300214614	G-52-03 ✓	Pu-238 ✓	0.0539 ✓✓	0.0047	pCi/g	
			Pu-238 DL	0.0020		pCi/g	
			Pu-239 ✓	1.9636 ✓✓	0.0688	pCi/g	
			Pu-239 DL	0.0025		pCi/g	
			Pu-242T Recovery	47.46		%	
			Analysis Date	02-NOV-1999		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096902	300214614	G-52-03	Count Time	1333.33		min	
			Efficiency	20.01		%	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
200096903	300214619	Pu-238	0.2986	0.0115	pCi/g	0.31	0.01	pCi/g	IN CONTROL
		Pu-239	0.5756	0.0193	pCi/g	0.60	0.02	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22776	300240425	Pu-238	0.0012	0.0006	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG
		Pu-239	0.0009	0.0004	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG

\*\*\*\* FINAL REPORT \*\*\*\*

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17-Nov-1999 11:26

Page 8 of 8

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037770

*K. S. Sathia*  
Analyst

*SG*  
Review

*GD*  
Team Leader

*AL*  
QA Officer

11-18-99  
Date

11/19/99  
Date

11/24/99  
Date

11/29/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol 1, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

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LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	15-JUL-99
Requester Group:	ESH-19	Logged Date:	12-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097228	300215263	38-02	Pu-238	0.0698	0.0068	pCi/g	
			Pu-238 DL	0.0068		pCi/g	
			Pu-239	1.0479	0.0467	pCi/g	
			Pu-239 DL	0.0054		pCi/g	
			Pu-242T Recovery	31.91		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.79		%	
200097231	300215268	29-01	Pu-238	0.0309	0.0041	pCi/g	
			Pu-238 DL	0.0031		pCi/g	
			Pu-239	0.0313	0.0042	pCi/g	
			Pu-239 DL	0.0045		pCi/g	
			Pu-242T Recovery	34.67		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

X

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097231	300215268	29-01	Count Time	1333.33		min	
			Efficiency	19.54		%	
200097232	300215273	29-02	Pu-238	0.0164	0.0029	pCi/g	
			Pu-238 DL	0.0054		pCi/g	
			Pu-239	0.0552	0.0053	pCi/g	
			Pu-239 DL	0.0031		pCi/g	
			Pu-242T Recovery	30.38		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	26.09		%	
200097233	300215278	29-03	Pu-238	0.0221	0.0041	pCi/g	
			Pu-238 DL	0.0072		pCi/g	
			Pu-239	0.0327	0.0049	pCi/g	
			Pu-239 DL	0.0045		pCi/g	
			Pu-242T Recovery	25.15		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.63		%	
200097234	300215283	30-01	Pu-238	0.0036	0.0014	pCi/g	
			Pu-238 DL	0.0030		pCi/g	
			Pu-239	0.0096	0.0023	pCi/g	
			Pu-239 DL	0.0047		pCi/g	
			Pu-242T Recovery	37.56		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097234	300215283	30-01	Efficiency	20.37		%	
200097235	300215288	31-01	Pu-238	0.0321	0.0042	pCi/g	
			Pu-238 DL	0.0043		pCi/g	
			Pu-239	0.1063	0.0080	pCi/g	
			Pu-239 DL	0.0032		pCi/g	
			Pu-242T Recovery	36.11		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.26		%	
200097236	300215293	31-02	Pu-238	0.0074	0.0021	pCi/g	
			Pu-238 DL	0.0034		pCi/g	
			Pu-239	0.0072	0.0024	pCi/g	
			Pu-239 DL	0.0066		pCi/g	
			Pu-242T Recovery	34.13		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.89		%	
200097237	300215298	31-03	Pu-238	0.0037	0.0014	pCi/g	
			Pu-238 DL	0.0024		pCi/g	
			Pu-239	0.0357	0.0043	pCi/g	
			Pu-239 DL	0.0027		pCi/g	
			Pu-242T Recovery	36.51		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.36		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097238	300215303	32-01 /	Pu-238	0.0026 ✓	0.0021	pCi/g	
			Pu-238 DL	0.0076 ✓		pCi/g	
			Pu-239	0.0073 ✓	0.0022	pCi/g	
			Pu-239 DL	0.0036		pCi/g	
			Pu-242T Recovery	33.17		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.10 ✓		%	
200097239	300215308	32-02	Pu-238	0.0065 ✓	0.0024	pCi/g	
			Pu-238 DL	0.0055 ✓		pCi/g	
			Pu-239	0.0914 ✓	0.0092	pCi/g	
			Pu-239 DL	0.0077		pCi/g	
			Pu-242T Recovery	21.45		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	21.86		%	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097238	300215303		Pu-238	0.0026	0.0021	pCi/g	
			Pu-238 DL	0.0076		pCi/g	
			Pu-239	0.0073	0.0022	pCi/g	
			Pu-239 DL	0.0036		pCi/g	
			Pu-242T Recovery	33.17		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097238	300215303		Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.10		%	
200122705	300257894	300215303	Pu-238	0.0016	0.0016	pCi/g	
			Pu-238 DL	0.0061		pCi/g	
			Pu-239	0.0040	0.0018	pCi/g	
			Pu-239 DL	0.0043		pCi/g	
			Pu-242T Recovery	27.90		%	
			Analysis Date	22-FEB-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.02		%	

\*\*\*\* FINAL REPORT \*\*\*\*

//

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200097243	300215313	Pu-238	0.5333	0.0259	pCi/g	0.62	0.02	pCi/g	WARNING 2-3SIG
		Pu-239	0.9086	0.0403	pCi/g	0.99	0.03	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300257895	Pu-238	0.0009	0.0005	pCi/g	0.0	0.0	pCi/g	IN CONTROL
		Pu-239	0.0026	0.0008	pCi/g	0.0	0.0	pCi/g	OUT OF CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100037835

PC Bhalla  
Analyst

STG  
Review

SS  
Team Leader

PLD  
QA Officer

2-24-00  
Date

2/25/00  
Date

2/25/00  
Date

2/26/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

12

**Los Alamos**  
**NATIONAL LABORATORY**  
**Memorandum**

**Chemistry Division**

*Responsible Chemistry for America*  
C-9/Analytical Chemistry Sciences  
Los Alamos, New Mexico 87545

To/MS: Files  
From/MS: Malti Bhatia, K484  
Phone/FAX: 7-7094/5-5982

Symbol: C-9/00

Date: April 6, 2000

This is a Case Narrative for the following:

**Submission ID** : 100039019  
**Analysis** : Am in Environmental Matrices-Alpha Spectroscopy

### **I. Introduction**

On July 14, 1999, a set of soil samples were delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Americium In Environmental Matrices - Alpha Spectroscopy. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC325, R.0.

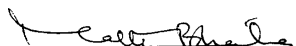
### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

Tracer recovery for this set of samples was in the 20-50% range. Time permitting we will reanalyze samples in the 20% range.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

  
Malti Bhatia

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200102506	300223793	SITE3	Am-241	0.0225 ✓	0.0031	pCi/g	
			Am-241 DL	0.0037		pCi/g	
			Am-243T Recovery	44.19		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.98		%	
200102513	300223800	SITE5	Am-241	0.0078 ✓	0.0018	pCi/g	
			Am-241 DL	0.0040		pCi/g	
			Am-243T Recovery	45.55		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.51		%	
200102514	300223807	SITE7A	Am-241	0.0045 ✓	0.0011	pCi/g	
			Am-241 DL	0.0028		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102514	300223807	SITE7A	Am-243T Recovery	47.63		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	26.51		%	
200102515	300223813	SITE7B	Am-241	0.0086 ✓	0.0021	pCi/g	
			Am-241 DL	0.0044		pCi/g	
			Am-243T Recovery	32.80		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.99		%	
200102516	300223821	SITE7C	Am-241	0.1405 ✓	0.0085	pCi/g	
			Am-241 DL	0.0031		pCi/g	
			Am-243T Recovery	44.10		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.60		%	
200102517	300223828	SITE4	Am-241	0.1460 ✓	0.0141	pCi/g	
			Am-241 DL	0.0430		pCi/g	
			Am-243T Recovery	25.25		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	22.12		%	
200102518	300223835	SITE6B	Am-241	0.0618 ✓	0.0056	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102518	300223835	SITE6B	Am-241 DL	0.0040		pCi/g	
			Am-243T Recovery	40.00		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.61		%	
200102519	300223842	SITE1	Am-241	0.0109	0.0028	pCi/g	
			Am-241 DL	0.0069		pCi/g	
			Am-243T Recovery	28.35		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.67		%	
200102520	300223848	SITE2	Am-241	0.0058	0.0015	pCi/g	
			Am-241 DL	0.0058		pCi/g	
			Am-243T Recovery	58.14		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	1333.33		min	
			Efficiency	21.93		%	
200102521	300223856	SITE3B	Am-241	0.0028	0.0009	pCi/g	
			Am-241 DL	0.0022		pCi/g	
			Am-243T Recovery	48.82		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.15		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102522	300223863	SITE8	Am-241	0.0105 ✓	0.0022	pCi/g	
			Am-241 DL	0.0025		pCi/g	
			Am-243T Recovery	34.78		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
200102523	300223870	SITE9	Efficiency	21.88	0.0028	%	
			Am-241	0.0112 ✓		pCi/g	
			Am-241 DL	0.0021		pCi/g	
			Am-243T Recovery	24.07		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.71		%	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223870		Am-241	0.0112	0.0028	pCi/g	
			Am-241 DL	0.0021		pCi/g	
			Am-243T Recovery	24.07		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	19.71		%	
			Am-241	0.0082		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

06-Apr-2000 13:30

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200126805	300265299	300223870	Am-241 DL	0.0068		pCi/g	
			Am-243T Recovery	28.88		%	
			Analysis Date	03-APR-2000		DD-MON-YYYY	
			Instrument	80 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	1333.33		min	
			Efficiency	20.19		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200102527	300223878	Am-241	0.5602	0.0209	pCi/g	0.58	0.03	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300265300	Am-241	-0.0005	0.0004	pCi/g	0.0	0.0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

06-Apr-2000 13:30

Page 7 of 7

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

M. B. Shalini  
Analyst

GS  
Review  
for SLL

GS  
Team Leader

PLA  
QA Officer

4.6.00  
Date

4/6/00  
Date

4/6/00  
Date

4/7/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

To/MS: ESH-20/M887  
From/MS: Nancy Lujan/ MS K484  
Phone/FAX: 5-6010/5-5982  
Symbol: CST-9/99  
Date: November 3, 1999

This is a Case Narrative for the following:

**Submission ID** : 100039019  
**Analysis** : U (KPA) in Soils

### **I. Introduction**

On July 14, 1999, a set of Soil samples was delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Uranium in Environmental Matrices – KPA. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC337, R.0.

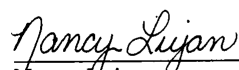
### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. As part of the process to inform our customers of potential problems associated with specific methods, the KPA method has been found to be unreliable in some matrices due to the strong susceptibility of interference's from constituents commonly found in environmental samples. Alternate techniques available for the analysis of U would be either ICP-MS or Isotopic Uranium analysis.

Samples were analyzed and reported. All Quality Control samples were In Control and reportable. I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

  
Nancy Lujan

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039019

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Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102506	300223795	SITE3	U	3.52	0.35	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102513	300223802	SITE5	U	2.47	0.25	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102514	300223809	SITE7A	U	2.80	0.28	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102515	300223815	SITE7B	U	2.37	0.24	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102516	300223823	SITE7C	U	2.58	0.26	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102517	300223830	SITE4	U	3.18	0.32	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102518	300223837	SITE6B	U	3.34	0.33	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102519	300223844	SITE1	U	2.37	0.24	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102520	300223850	SITE2	U	2.35	0.24	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039019

10 of 30

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102521	300223858	SITE3B	U	3.53	0.35	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102522	300223865	SITE8	U	3.16	0.32	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200102523	300223872	SITE9	U	3.27	0.33	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223872		U	3.27	0.33	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	
200113297	300242718	300223872	U	2.40	0.24	ug/g	
			Analysis Date	27-OCT-1999		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039019

11/04/30

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200102529	300223876	U	2.64	0.26	ug/g	2.99	0.06	ug/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.38058	300242717	U	10.34	1.03	ug/L	10.1	1.0	ug/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300242719	U	0.00	0.01	ug/g	0	0	ug/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

03-Nov-1999 13:06

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Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039019

12 Oct 30

ml  
Analyst

SJK  
Review

CS  
Team Leader

UPH  
QA Officer

11/3/99  
Date

11/5/99  
Date

11/8/99  
Date

11/12/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry:  
1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

To/MS: Phil Fresquez/ MS M887  
From/MS: S. R. Garcia/ MS K484  
Phone/FAX: 5-0270/5-5982  
Symbol: CST-9-PRF-99-20  
Date: November 15, 1999

This is a Case Narrative for the following:

**Submission ID** : 100039019  
**Analysis** : CS-137 ASSAY OF SOILS

### **I. Introduction**

On July 14, 1999 a set of soil samples were delivered to the CST-9 radiochemistry section for the <sup>137</sup>Cs analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Gamma-Ray-Emitting Nuclides in Environmental Matrices - Gamma Spectroscopy, an Instrumental Method. The specific procedure can be found on line @ <http://cst.lanl.gov/docs>, Method ANC328, R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

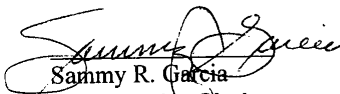
This case narrative was generated to document the circumstances that were involved with the development of this data package.

The soil samples were picked up at Cage 7, Bldg. 1, TA-59.

All open and blind QC's are within CST-9's statistical acceptance criteria. Duplicate tasks were also within CST-9's statistical acceptance criteria.

Please feel free to call or email me if you have any questions concerning this submission.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Sammy R. Garcia  
Email: [garcia\\_s@lanl.gov](mailto:garcia_s@lanl.gov)

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100039019

Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102506	300223790	SITE3	CS-137	0.006 ✓	0.022	pCi/g	
			CS-137 MDA	0.011		pCi/g	
200102513	300223797	SITE5	CS-137	0.044 ✓	0.013	pCi/g	
			CS-137 MDA	0.036 ✓		pCi/g	
200102514	300223804	SITE7A	CS-137	0.011 ✓	0.057	pCi/g	
			CS-137 MDA	0.029 ✓		pCi/g	
200102515	300223817	SITE7B	CS-137	0.027 ✓	0.013	pCi/g	
			CS-137 MDA	0.031 ✓		pCi/g	
200102516	300223818	SITE7C	CS-137	0.416 ✓	0.048	pCi/g	
			CS-137 MDA	0.034 ✓		pCi/g	
200102517	300223825	SITE4	CS-137	0.419 ✓	0.053	pCi/g	
			CS-137 MDA	0.052 ✓		pCi/g	
200102518	300223832	SITE6B	CS-137	0.343 ✓	0.045	pCi/g	
			CS-137 MDA	0.045 ✓		pCi/g	
200102519	300223839	SITE1	CS-137	0.396 ✓	0.045	pCi/g	
			CS-137 MDA	0.030 ✓		pCi/g	
200102520	300223852	SITE2	CS-137	0.371 ✓	0.048	pCi/g	
			CS-137 MDA	0.048		pCi/g	

\*\*\*\*\* FINAL REPORT \*\*\*\*\*

Method: GENERIC GAMMA Method Area: EH-GAMMA Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102521	300223853	SITE3B	CS-137	0.301 ✓	0.042	pCi/g	
			CS-137 MDA	0.047 ✓		pCi/g	
200102522	300223860	SITE8	CS-137	0.369 ✓	0.048	pCi/g	
			CS-137 MDA	0.046		pCi/g	
200102523	300223867	SITE9	CS-137	0.539	0.062	pCi/g	
			CS-137 MDA	0.037		pCi/g	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223867		CS-137	0.539	0.062	pCi/g	
			CS-137 MDA	0.037		pCi/g	
200114060	300244029	300223867	CS-137	0.528	0.059	pCi/g	
			CS-137 MDA	0.032		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100039019

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200102526	300238470	CS-137	26.2	2.8	pCi/g	21.6	0.7	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.42258	300244028	CS-137	5.20	0.55	pCi/g	5.0	0.16	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300244027	CS-137	0.006	0.022	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

15-Nov-1999 12:00

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Method: GENERIC GAMMA

Method Area: EH-GAMMA

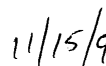
Submission Id : 100039019


  
\_\_\_\_\_  
Analyst


  
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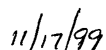
  
\_\_\_\_\_  
Team Leader

  
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QA Officer

  
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The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

Los Alamos  
NATIONAL LABORATORY  
Memorandum  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

To/MS: Phil Fresquez/ MS M887  
From/MS: S. R. Garcia/ MS K484  
Phone/FAX: 5-0270/5-5982  
Symbol: CST-9-MC-99-2  
Date: August 19, 1999

This is a Case Narrative for the following:

**Submission ID** : 100037772  
**Analysis** : CS-137 AND AM-241 ASSAY OF 100g SOIL SAMPLES

### **I. Introduction**

On May 10, 1999 a set of soil samples were delivered to the CST-9 radiochemistry section for the  $^{137}\text{Cs}$  and  $^{241}\text{Am}$  analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Gamma-Ray-Emitting Nuclides in Environmental Matrices - Gamma Spectroscopy, an Instrumental Method. The specific procedure can be found on line @ <http://cst.lanl.gov/docs>, Method ANC328, R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package.

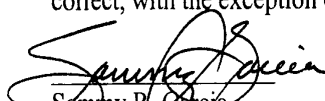
The soil samples were picked up at Cage 7, Bldg. 1, TA-59.

All open and blind QC's are within CST-9's statistical acceptance criteria.

This soil data set represents a change to the latest version of GammaVision-32 software for calculating gamma spectroscopy results. This will be used from now on. Calculated individual sample MDA values will also be reported!

Please feel free to call or email me if you have any questions concerning this submission.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Sammy R. Garcia  
Email: [garcia\\_s@lanl.gov](mailto:garcia_s@lanl.gov)

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037772

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096912	300221108	G-45-07 /	CS-137	0.331 ✓	0.080	pCi/g	
			AM-241	0.417	0.270	pCi/g	
			AM-241 MDA	0.048		pCi/g	
			CS-137 MDA	0.026		pCi/g	
200096914	300221109	G-45-01 /	CS-137	0.218 ✓	0.070	pCi/g	
			AM-241	0.387	0.270	pCi/g	
			AM-241 MDA	0.224		pCi/g	
			CS-137 MDA	0.032		pCi/g	
200096915	300221110	G-45-06 /	CS-137	0.125 ✓	0.160	pCi/g	
			AM-241	0.150	0.460	pCi/g	
			AM-241 MDA	0.253		pCi/g	
			CS-137 MDA	0.067		pCi/g	
200096916	300221111	G-44-01 /	CS-137	0.251 ✓	0.100	pCi/g	
			AM-241	0.338	0.290	pCi/g	
			AM-241 MDA	0.241		pCi/g	
			CS-137 MDA	0.042		pCi/g	
200096917	300221112	G-45-05 /	CS-137	0.621 ✓	0.130	pCi/g	
			AM-241	0.271	0.310	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037772

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200096917	300221112	G-45-05	AM-241 MDA	0.265 ✓		pCi/g	
			CS-137 MDA	0.018 ✗		pCi/g	
200096918	300221113	G-45-04	CS-137	0.302 ✓	0.080	pCi/g	
			AM-241	0.000	0.499	pCi/g	
			AM-241 MDA	0.250		pCi/g	
			CS-137 MDA	0.024		pCi/g	
200096919	300221115	G-44-07 ✓	CS-137	0.268 ✓	0.080	pCi/g	
			AM-241	0.163 ✓	0.270	pCi/g	
			AM-241 MDA	0.238		pCi/g	
			CS-137 MDA	0.026		pCi/g	
200096920	300221117	G-43-01 ✓	CS-137	0.355 ✓	0.090	pCi/g	
			AM-241	0.331 ✓	0.290	pCi/g	
			AM-241 MDA	0.245		pCi/g	
			CS-137 MDA	0.033		pCi/g	
200096921	300221118	G-42-06 ✓	CS-137	0.142 ✓	0.070	pCi/g	
			AM-241	0.136 ✓	0.290	pCi/g	
			AM-241 MDA	0.256		pCi/g	
			CS-137 MDA	0.036		pCi/g	
200096922	300221119	G-41-02 ✓	CS-137	0.286 ✓	0.080	pCi/g	
			AM-241	0.311 ✓	0.310	pCi/g	
			AM-241 MDA	0.261 ✗		pCi/g	
			CS-137 MDA	0.032 ✗		pCi/g	
200096923	300221120	G-40-02 ✓	CS-137	0.126 ✓	0.050	pCi/g	
			AM-241	0.310 ✓	0.290	pCi/g	
			AM-241 MDA	0.244		pCi/g	
			CS-137 MDA	0.035		pCi/g	
200096924	300221121	G-40-01 ✓	CS-137	0.327 ✓	0.080	pCi/g	
			AM-241	0.479 ✓	0.270	pCi/g	
			AM-241 MDA	0.207		pCi/g	
			CS-137 MDA	0.017		pCi/g	
200096925	300221122	G-42-01 ✓	CS-137	0.171	0.060	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037772

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096925	300221122	G-42-01 ✓	AM-241	0.322 ✓	0.250	pCi/g	
			AM-241 MDA	0.203		pCi/g	
			CS-137 MDA	0.027		pCi/g	
200096926	300221123	G-39-01 ✓	CS-137	0.078 ✓	0.040	pCi/g	
			AM-241	0.335 ✓		pCi/g	
			AM-241 MDA	0.170		pCi/g	
200096927	300221124	G-39-02 ✓	CS-137	0.070 ✓	0.040	pCi/g	
			AM-241	0.173 ✓		pCi/g	
			AM-241 MDA	0.205		pCi/g	
			CS-137 MDA	0.026		pCi/g	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096927	300221124		CS-137	0.070	0.040	pCi/g	
			AM-241	0.173		pCi/g	
			AM-241 MDA	0.205	0.24	pCi/g	
			CS-137 MDA	0.026		pCi/g	
200106156	300230196	300221124	CS-137	0.092	0.05	pCi/g	
			AM-241	0.23		pCi/g	
			AM-241 MDA	0.189	0.22	pCi/g	
			CS-137 MDA	0.02		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037772

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200096929	300221136	AM-241	2.38	0.64	pCi/g	3.14	.141	pCi/g	IN CONTROL
		CS-137	37.95	6.47	pCi/g	43.99	1.45	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.33404	300230195	AM-241	3.69	0.74	pCi/g	5.000	0.2200	pCi/g	IN CONTROL
		CS-137	4.42	0.74	pCi/g	4.9800	0.1600	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300230194	AM-241	0.054	0.11	pCi/g	0	0	pCi/g	IN CONTROL
		CS-137	0.0006	0.01	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

19-Aug-1999 10:13

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Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037772

SP  
Analyst

STB  
Review

STB for GR  
Team Leader

AL  
QA Officer

8/19/99  
Date

8/20/99  
Date

8/20/99  
Date

8/25/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry:  
1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

20-Aug-1999 14:58

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Page 1 of 5

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037835

Requester Name:	MARQUIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	15-JUL-99
Requester Group:	ESH-19	Logged Date:	12-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097228	300221056	38-02 ✓	CS-137	0.165	0.23	pCi/g	
			Am-241	0.753	0.41	pCi/g	
			CS-137 MDA	0.048		pCi/g	
			Am-241 MDA	0.321		pCi/g	
200097231	300221075	29-01 ✓	CS-137	0.23	0.07	pCi/g	
			Am-241	0.402	0.43	pCi/g	
			CS-137 MDA	0.037		pCi/g	
			Am-241 MDA	0.372		pCi/g	
200097232	300221076	29-02 ✓	CS-137	0.262	0.09	pCi/g	
			Am-241	0.522	0.45	pCi/g	
			CS-137 MDA	0.061		pCi/g	
			Am-241 MDA	0.384		pCi/g	
200097233	300221077	29-03 ✓	CS-137	0.396	0.1	pCi/g	
			Am-241	0	1.13	pCi/g	
			CS-137 MDA	0.043		pCi/g	
			Am-241 MDA	0.57		pCi/g	
200097234	300221078	30-01 ✓	CS-137	0.071	0.05	pCi/g	
			Am-241	0.155	0.32	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: **GENERIC GAMMA** Method Area: **EH-GAMMA** Submission Id : **100037835**

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097234	300221078	30-01	CS-137 MDA	0.039		pCi/g	
			Am-241 MDA	0.279		pCi/g	
200097235	300221079	31-01 ✓	CS-137	1.38 ✓	0.25	pCi/g	
			Am-241	0 ✓	0.661	pCi/g	
			CS-137 MDA	0.04		pCi/g	
			Am-241 MDA	0.33		pCi/g	
200097236	300221080	31-02 ✓	CS-137	0.1 ✓	0.06	pCi/g	
			Am-241	0.91 ✓	0.43	pCi/g	
			CS-137 MDA	0.049		pCi/g	
			Am-241 MDA	0.344		pCi/g	
200097237	300221081	31-03 ✓	CS-137	0.3 ✓	0.09	pCi/g	
			Am-241	0.32 ✓	0.41	pCi/g	
			CS-137 MDA	0.029		pCi/g	
			Am-241 MDA	0.353		pCi/g	
200097238	300221082	32-01 ✓	CS-137	0.09 ✓	0.06	pCi/g	
			Am-241	0.73 ✓	0.38	pCi/g	
			CS-137 MDA	0.045		pCi/g	
			Am-241 MDA	0.294		pCi/g	
200097239	300221083	32-02 ✓	CS-137	0.491 ✓	0.18	pCi/g	
			Am-241	0.461 ✓	0.43	pCi/g	
			CS-137 MDA	0.061		pCi/g	
			Am-241 MDA	0.369		pCi/g	

**DUPLICATE TASKS**

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097238	300221082		CS-137	0.09	0.06	pCi/g	
			Am-241	0.73	0.38	pCi/g	
			CS-137 MDA	0.045		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037835

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200097238	300221082		Am-241 MDA	0.294		pCi/g	
200106510	300230741	300221082	CS-137	0.069	0.06	pCi/g	
			Am-241	0.086	0.32	pCi/g	
			CS-137 MDA	0.053		pCi/g	
			Am-241 MDA	0.288		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037835

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200097242	300221084	CS-137	12.2	2.1	pCi/g	11.53	0.36	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.33404	300230740	Am-241	4.03	0.92	pCi/g	5.000	0.2200	pCi/g	IN CONTROL
		CS-137	4.5	0.76	pCi/g	4.9800	0.1600	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300230739	Am-241	0.036	0.03	pCi/g	0	0	pCi/g	IN CONTROL
		CS-137	0.007	0.02	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

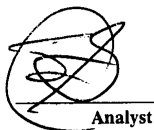
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Page 5 of 5

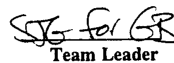
Method: GENERIC GAMMA

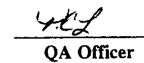
Method Area: EH-GAMMA

Submission Id : 100037835

  
Analyst


  
Review

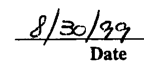
  
Team Leader

  
QA Officer

  
Date

  
Date

  
Date

  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

18-Aug-1999 10:56

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Page 1 of 6

Method: GENERIC GAMMA Method Area: EH-GAMMA Submission Id : 100037770

Requester Name:	MARUQIS CHILDS	Customer Cost Code:	7C1900WE5J00000000	Due Date:	14-JUL-99
Requester Group:	ESH-19	Logged Date:	10-MAY-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	K490	Study:	ESH19 GENERAL SAMPLES	Logged by:	LBRANCH
Requester Phone:	665-9442	Analytical Service Agreement #:			
Requester Fax #:					

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096888	300221085	G-34-15	CS-137	0.117 ✓	0.060	pCi/g	
			AM-241	0.750 ✓	0.410	pCi/g	
			AM-241 MDA	0.318		pCi/g	
			CS-137 MDA	0.038		pCi/g	
200096889	300221086	G-34-09	CS-137	0.084 ✓	0.060	pCi/g	
			AM-241	0.649 ✓	0.420	pCi/g	
			AM-241 MDA	0.346		pCi/g	
			CS-137 MDA	0.044		pCi/g	
200096890	300221087	G-49-01	CS-137	0.126 ✓	0.060	pCi/g	
			AM-241	0.416 ✓	0.400	pCi/g	
			AM-241 MDA	0.342		pCi/g	
			CS-137 MDA	0.037		pCi/g	
200096891	300221088	G-34-10	CS-137	0.485 ✓	0.110	pCi/g	
			AM-241	1.10 ✓	0.43	pCi/g	
			AM-241 MDA	0.30		pCi/g	
			CS-137 MDA	0.045		pCi/g	
200096892	300221089	G-34-07	CS-137	0.174 ✓	0.070	pCi/g	
			AM-241	0.806 ✓	0.390	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037770

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096892	300221089	G-34-07 ✓	AM-241 MDA	0.292		pCi/g	
			CS-137 MDA	0.046		pCi/g	
200096893	300221090	G-49-04 ✓	CS-137	0.110 ✓	0.050	pCi/g	
			AM-241	1.11 ✓	0.39	pCi/g	
			AM-241 MDA	0.24		pCi/g	
			CS-137 MDA	0.037		pCi/g	
200096894	300221091	G-48-02 ✓	CS-137	0.137 ✓	0.050	pCi/g	
			AM-241	0.000 ✓	0.723	pCi/g	
			AM-241 MDA	0.362		pCi/g	
			CS-137 MDA	0.033		pCi/g	
200096895	300221092	G-46-02 ✓	CS-137	0.140 ✓	0.060	pCi/g	
			AM-241	2.78 ✓	0.61	pCi/g	
			AM-241 MDA	0.05		pCi/g	
			CS-137 MDA	0.034		pCi/g	
200096896	300221093	G-50-01 ✓	CS-137	0.072 ✓	0.050	pCi/g	
			AM-241	1.34 ✓	0.40	pCi/g	
			AM-241 MDA	0.20		pCi/g	
			CS-137 MDA	0.035		pCi/g	
200096897	300221094	G-47-01 ✓	CS-137	0.515 ✓	0.140	pCi/g	
			AM-241	0.169 ✓	0.330	pCi/g	
			AM-241 MDA	0.294		pCi/g	
			CS-137 MDA	0.035		pCi/g	
200096898	300221095	G-34-05 ✓	CS-137	0.110 ✓	0.060	pCi/g	
			AM-241	0.850 ✓	0.420	pCi/g	
			AM-241 MDA	0.322		pCi/g	
			CS-137 MDA	0.043		pCi/g	
200096899	300221096	G-50-02 ✓	CS-137	0.132 ✓	0.060	pCi/g	
			AM-241	0.397 ✓	0.400	pCi/g	
			AM-241 MDA	0.340		pCi/g	
			CS-137 MDA	0.037		pCi/g	
200096900	300221097	G-58-01 ✓	CS-137	0.386 ✓	0.100	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

4/5/00  
R/

Method: **GENERIC GAMMA** Method Area: **EH-GAMMA** Submission Id : **100037770**

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096900	300221097	G-58-01 ✓	AM-241	0.526 ✓	0.370	pCi/g	
			AM-241 MDA	0.302		pCi/g	
			CS-137 MDA	0.016		pCi/g	
			CS-137	0.271 ✓		pCi/g	
200096901	300221098	G-46-01 ✓	AM-241	0.773 ✓	0.410	pCi/g	
			AM-241 MDA	0.319		pCi/g	
			CS-137 MDA	0.031		pCi/g	
			CS-137	0.082 ✓		pCi/g	
200096902	300221099	G-52-03 ✓	AM-241	0.252 ✓	0.310	pCi/g	
			AM-241 MDA	0.265		pCi/g	
			CS-137 MDA	0.039		pCi/g	
			CS-137	0.082 ✓		pCi/g	

**DUPLICATE TASKS**

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200096902	300221099		CS-137	0.082	0.310	pCi/g	
			AM-241	0.252		pCi/g	
			AM-241 MDA	0.265		pCi/g	
			CS-137 MDA	0.039		pCi/g	
200106022	300230037	300221099	CS-137	0.079	0.280	pCi/g	
			AM-241	0.299		pCi/g	
			AM-241 MDA	0.231		pCi/g	
			CS-137 MDA	0.034		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037770

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200096910	300221106	AM-241	2.60	1.69	pCi/g	2.96	0.13	pCi/g	IN CONTROL
		CS-137	13.4	2.3	pCi/g	18.24	0.58	pCi/g	WARNING 2-3SIG
200096911	300221107	AM-241	2.30	0.79	pCi/g	3.33	.15	pCi/g	IN CONTROL
		CS-137	36.8	6.3	pCi/g	50.06	1.65	pCi/g	WARNING 2-3SIG

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.33404	300230036	AM-241	3.99	0.91	pCi/g	5.000	0.2200	pCi/g	IN CONTROL
		CS-137	4.71	0.79	pCi/g	4.9800	0.1600	pCi/g	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300230035	AM-241	0.036	0.030	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

18-Aug-1999 10:56

Page 5 of 6

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037770

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22776	300230035	CS-137	0.007	0.020	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

18-Aug-1999 10:56

Page 6 of 6

11

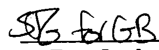
Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100037770

  
Analyst

  
Review

  
Team Leader

  
QA Officer

8/18/99  
Date

8/19/99  
Date

8/19/99  
Date

8/19/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Analytical Chemistry and Science  
Los Alamos, New Mexico 87545

To/MS: Files  
From/MS: Edward Gonzales/ MS K484  
Phone/FAX: 7-7094/5-5982  
Symbol: CST-9/99  
Date: February 4, 2000

This is a Case Narrative for the following:

**Submission ID: 100039019**  
**Analysis: Sr in soils**

#### **I. Introduction**

In July 1999, a set of samples was delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Strontium In Environmental Matrices – Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC367, R.1.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

#### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. All control perimeters were acceptable.

I verify, to the best of my knowledge that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Edward R. Gonzales

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Requester Name:	PHIL FRESQUEZ	Customer Cost Code:	M34A0002106CA30000	Due Date:	14-SEP-99
Requester Group:	ESH-20	Logged Date:	14-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	LBRANCH
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102506	300223796	SITE3	Sr-90	0.99 ✓	0.34	pCi/g	
			Sr-90 MDA	0.66		pCi/g	
200102513	300223803	SITE5	Sr-90	-0.04 ✓	0.34	pCi/g	
			Sr-90 MDA	0.79		pCi/g	
200102514	300223810	SITE7A	Sr-90	-0.09 ✓	0.34	pCi/g	
			Sr-90 MDA	0.77		pCi/g	
200102515	300223816	SITE7B	Sr-90	0.44 ✓	0.36	pCi/g	
			Sr-90 MDA	0.76		pCi/g	
200102516	300223824	SITE7C	Sr-90	0.84 ✓	0.35	pCi/g	
			Sr-90 MDA	0.71		pCi/g	
200102517	300223831	SITE4	Sr-90	1.58 ✓	0.41	pCi/g	
			Sr-90 MDA	0.76		pCi/g	
200102518	300223838	SITE6B	Sr-90	0.43 ✓	0.34	pCi/g	
			Sr-90 MDA	0.73		pCi/g	
200102519	300223845	SITE1	Sr-90	-0.42 ✓	0.33	pCi/g	
			Sr-90 MDA	0.71		pCi/g	
200102520	300223851	SITE2	Sr-90	0.21 ✓	0.34	pCi/g	
			Sr-90 MDA	0.75		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102521	300223859	SITE3B	Sr-90	-0.10 ✓	0.36	pCi/g	
			Sr-90 MDA	0.83 ✓		pCi/g	
200102522	300223866	SITE8	Sr-90	0.51 ✓	0.36	pCi/g	
			Sr-90 MDA	0.76 ✓		pCi/g	
200102523	300223873	SITE9	Sr-90	0.52 ✓	0.32	pCi/g	
			Sr-90 MDA	0.67		pCi/g	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102523	300223873		Sr-90	0.52	0.32	pCi/g	
			Sr-90 MDA	0.67		pCi/g	
200120522	300254829	300223873	Sr-90	1.15	0.35	pCi/g	
			Sr-90 MDA	0.65		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200102528	300223880	Sr-90	24.43	1.85	pCi/g	29.9	0.90	pCi/g	WARNING 2-3SIG

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.36592	300254831	Sr-90	559	92	pCi/L	499.5	15.98	pCi/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22778	300254830	Sr-90	-1.76	0.61	pCi/g	0.0	0.0	pCi/g	WARNING 2-3SIG

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039019

Eef  
Analyst

STG  
Review

BS  
Team Leader

AL  
QA Officer

02/04/00  
Date

2/7/00  
Date

2/7/00  
Date

2/7/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

# CHAIN-OF-CUSTODY RECORD

Los Alamos

Los Alamos National Laboratory

Los Alamos, New Mexico 87545

Soils and Foodstuffs (7C20 ~~WESG~~)

P.L.# (S05) 667-0815

ESII-20 MS M887

M34A/02106/CA3

Project Name		Request the following analysis:		L A B O R A T O R Y	S A M P L E L O C A T I O N	Sample Location/Remarks
Date	Time	Sample Name/Number				
Area 6 Soils		3H, <sup>232</sup> Pu, <sup>239</sup> Pu, Total U 90Sr, <sup>137</sup> Cs, <sup>241</sup> Am % moisture				Area-G Soils Samples from inside fenced Areas, and outside fenced Areas.
7/7/99	9:30	Site 3	1			Site #3, east of active pit inside fence
7/7/99	10:00	Site 5	1			TRU waste pad #2
7/7/99	10:30	Site 7a	1			South of Pits 17 & 18, south of Bldg 54-375
7/7/99	11:10	Site 7b	1			Pit 6, north of barn
7/8/99	9:40	Site 7c	1			Outside fence north of Bldg 54-375
7/8/99	10:20	Site 4	1			Outside fence, north of TRU pit #2
7/8/99	10:40	Site 6b	1			Outside fence, east of TRU pads on mesa
7/8/99	2:15	Site 1	1			Outside fence, south of tritium shaft
7/8/99 MHE	2:30 MHE					
7/9/99	7:00	Site 2	1			Site 2, west of tritium shaft, outside fence
7/9/99	7:45	Site 3b	1			North west of active pit, outside fence
7/9/99	10:10	Site 8	1			Expansion Area, 1/2 mile west of Area G.
7/9/99	Site 9 MHE 11:00	Site 9	1			Bandelier National Park, Research Area
Relinquished by: (signature)		Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
7/12/99		7/12/99 9:50 a.m.				
Relinquished by: (signature)		Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time	Received by: (signature)
Relinquished by: (signature)		Date/Time	Received for Lab. by: (signature)	Date/Time	Remarks:	

7-13

## **APPENDIX B**

### **CST-9 ANALYTICAL REPORTS OF RADIONUCLIDES IN UNWASHED VEGETATION SAMPLES AT AREA G**



**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS: Michael Ebinger /MS M887*  
*From/MS: Anthony Sanchez/MSK484*  
*Phone/FAX: 7-5998/5-5982*  
*Symbol: CST-9/99*  
*Date: September 7,1999*

This is a Case Narrative for the following:

***Submission ID: 100039126***  
***Analysis: Tritium Analysis in Water***

#### **I. Introduction**

On July 20,1999 a set of water samples was delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is Tritium in Environmental Matrices – Distillation and Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC355, R.1.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the submitted samples.

#### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. This submission was batched for QA and QC with two other submissions. I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

 9/17/99  
Anthony Sanchez

07-Sep-1999 11:43

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 10000010

Requester Name:	MIKE EBINGER	Customer Cost Code:	M34A0002106CA30000	Due Date:	21-SEP-99
Requester Group:	ESH-20	Logged Date:	20-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

CUSTOMER SAMPLES

OK 8-5-99

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102986	300224637	3-US	H-3	1650 ✓	710	pCi/L	
			H-3 MDA	420		pCi/L	
200102988	300224638	3-OS	H-3	2150 ✓	750	pCi/L	
			H-3 MDA	440		pCi/L	
200102989	300224639	5-US	H-3	1820000 ✓	51000	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200102990	300224640	7A-US	H-3	8000 ✓	1100	pCi/L	
			H-3 MDA	400 ✓		pCi/L	
200102991	300224641	7B-US	H-3	4800 ✓	900	pCi/L	
			H-3 MDA	430 ✓		pCi/L	
200102992	300224642	7C-OS	H-3	3780 ✓	840	pCi/L	
			H-3 MDA	420 ✓		pCi/L	
200102993	300224643	7C-US	H-3	3770 ✓	840	pCi/L	
			H-3 MDA	440 ✓		pCi/L	
200102994	300224644	4-OS	H-3	5140 ✓	920	pCi/L	
			H-3 MDA	420 ✓		pCi/L	
200102995	300224645	4-US	H-3	7700 ✓	1000	pCi/L	
			H-3 MDA	400		pCi/L	

9/17/99

0000

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100019124

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102996	300224646	6B-US	H-3	400 ✓	630	pCi/L	
			H-3 MDA	410		pCi/L	
200102997	300224647	6B-OS	H-3	610 ✓	640	pCi/L	
			H-3 MDA	410		pCi/L	
200102998	300224648	1-US	H-3	637000 ✓	19000	pCi/L	
			H-3 MDA	400		pCi/L	
200102999	300224649	1-OS	H-3	165700 ✓	5900	pCi/L	
			H-3 MDA	400		pCi/L	

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

Page: 1 of 1

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

\*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
200103007	300224658	H-3	8600	1100	pCi/L	10900	400	pCi/L	WARNING 2-3SIG

0008

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

Page 4 of 4

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

*[Signature]*  
Analyst

*[Signature]*  
Review

*[Signature]*  
Team Leader

*[Signature]*  
QA Officer

9/7/99  
Date

9/8/99  
Date

9/9/99  
Date

9/10/99  
Date

0009

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

Requester Name:	MIKE EBINGER	Customer Cost Code:	M34A0002106CA30000	Due Date:	21-SEP-99
Requester Group:	ESH-20	Logged Date:	20-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102986	300224637	3-US	H-3	1650	710	pCi/L	
			H-3 MDA	420		pCi/L	
200102988	300224638	3-OS	H-3	2150	750	pCi/L	
			H-3 MDA	440		pCi/L	
200102989	300224639	5-US	H-3	1820000	51000	pCi/L	
			H-3 MDA	440		pCi/L	
200102990	300224640	7A-US	H-3	8000	1100	pCi/L	
			H-3 MDA	400		pCi/L	
200102991	300224641	7B-US	H-3	4800	900	pCi/L	
			H-3 MDA	430		pCi/L	
200102992	300224642	7C-OS	H-3	3780	840	pCi/L	
			H-3 MDA	420		pCi/L	
200102993	300224643	7C-US	H-3	3770	840	pCi/L	
			H-3 MDA	440		pCi/L	
200102994	300224644	4-OS	H-3	5140	920	pCi/L	
			H-3 MDA	420		pCi/L	
200102995	300224645	4-US	H-3	7700	1000	pCi/L	
			H-3 MDA	400		pCi/L	

0006

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102996	300224646	6B-US	H-3	400	630	pCi/L	
			H-3 MDA	410		pCi/L	
200102997	300224647	6B-OS	H-3	610	640	pCi/L	
			H-3 MDA	410		pCi/L	
200102998	300224648	1-US	H-3	637000	19000	pCi/L	
			H-3 MDA	400		pCi/L	
200102999	300224649	1-OS	H-3	165700	5900	pCi/L	
			H-3 MDA	400		pCi/L	

Handwritten notes: 9/17/99 (B) and 400

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
200103007	300224658	H-3	8600	1100	pCi/L	10900	400	pCi/L	WARNING 2-3SIG


\*\*\*\* FINAL REPORT \*\*\*\*

00008

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039126

  
Analyst

  
Review

  
Team Leader

  
QA Officer

9/7/99  
Date

9/8/99  
Date

9/7/99  
Date

9/10/99  
Date

0000

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Page 1 of 2

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039127

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	6CA300M34A02100000	Due Date:	21-SEP-99
Requester Group:	ESH-20	Logged Date:	20-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	APODACA
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

ck 4/5/02

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102987	300224650	2-OS	H-3	678000 ✓	20000	pCi/L	
			H-3 MDA	400		pCi/L	
200103000	300224651	2-US	H-3	2535000 ✓	70000	pCi/L	
			H-3 MDA	400		pCi/L	
200103001	300224652	3B-OS	H-3	-40 ✓	600	pCi/L	
			H-3 MDA	420		pCi/L	
200103002	300224653	3B-US	H-3	-180 ✓	590	pCi/L	
			H-3 MDA	420		pCi/L	
200103003	300224654	8-OS	H-3	50 ✓	600	pCi/L	
			H-3 MDA	420		pCi/L	
200103004	300224655	8-US	H-3	-10 ✓	600	pCi/L	
			H-3 MDA	430		pCi/L	
200103005	300224656	9-OS	H-3	-110 ✓	590	pCi/L	
			H-3 MDA	420		pCi/L	
200103006	300224657	9-US	H-3	400 ✓	630	pCi/L	
			H-3 MDA	430		pCi/L	

0006

\*\*\*\* FINAL REPORT \*\*\*\*

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039127

lip  
Analyst

SJC  
Review

DS  
Team Leader

RL  
QA Officer

9/7/99  
Date

9/8/99  
Date

9/9/99  
Date

9/12/99  
Date

0007

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100019127

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	6CA300M34A02100000	Due Date:	21-SEP-99
Requester Group:	ESH-20	Logged Date:	20-JUL-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	APODACA
Requester Phone:	667-0815	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200102987	300224650	2-OS	H-3	678000	20000	pCi/L	
			H-3 MDA	400		pCi/L	
200103000	300224651	2-US	H-3	2535000	70000	pCi/L	
			H-3 MDA	400		pCi/L	
200103001	300224652	3B-OS	H-3	-40	600	pCi/L	
			H-3 MDA	420		pCi/L	
200103002	300224653	3B-US	H-3	-180	590	pCi/L	
			H-3 MDA	420		pCi/L	
200103003	300224654	8-OS	H-3	50	600	pCi/L	
			H-3 MDA	420		pCi/L	
200103004	300224655	8-US	H-3	-10	600	pCi/L	
			H-3 MDA	430		pCi/L	
200103005	300224656	9-OS	H-3	-110	590	pCi/L	
			H-3 MDA	420		pCi/L	
200103006	300224657	9-US	H-3	400	630	pCi/L	
			H-3 MDA	430		pCi/L	

0006

\*\*\*\* FINAL REPORT \*\*\*\*

07-Sep-1999 11:43

Page 2 of 2

Method: H-3 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039127

*lip*  
Analyst

*STG*  
Review

*OS*  
Team Leader

*PLS*  
QA Officer

9/7/99  
Date

9/8/99  
Date

9/9/99  
Date

9/12/99  
Date

2000

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

Los Alamos  
NATIONAL LABORATORY  
Memorandum  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

To/MS: Michael Ebinger ESH-20/M887  
From/MS: Claudine Armenta/K484  
Phone/FAX: 5-7358/5-5982  
Symbol: CST-9/00  
Date: January 13, 2000

210

This is a Case Narrative for the following.

**Submission ID** : 100039363  
**Analysis** : Pu analysis on Biological Samples

#### **I. Introduction**

On August 20, 1999, twenty-two biological samples were delivered to the CST-9 radiochemistry section for the requested analysis.

#### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Actinides In Environmental Matrices, (Biological A& Filters) - Alpha Spectroscopy. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC372 R.0.

#### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

#### **IV. Comments**

Twenty-two samples were analyzed for Plutonium-238 and Plutonium-239. These samples are spiked with Plutonium-242.

All Quality Control parameters are within appropriate limits and as such meet CST-9's quality assurance program objectives. Sample number 200104353 is flagged with problem code (TRO), this indicates that the tracer recovery was out of range. The range is 30%-110% therefore this flag is in error, because the percent recovery is 105.38% it should be disregarded.

I verify, to the best of my knowledge that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Claudine E. Armenta 4/13/00

011  
13-Jan-2000 14:05

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

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Method: PU RAS ENV Method Area: EH-ALPHA Submission Id : 100039363

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	000000M34A02106CA3	Due Date:	05-OCT-99
Requester Group:	ESH-20	Logged Date:	03-AUG-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	665-3147	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104343	300227098	3-US	Pu-238	-0.0024 ✓	0.0018	pCi/g	
			Pu-238 DL	0.0085 ✓		pCi/g	
			Pu-239	0.0051 ✓	0.0023	pCi/g	
			Pu-239 DL	0.0087 ✓		pCi/g	
			Pu-242T Recovery	90.26		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.56		%	
200104346	300227103	3-OS	Pu-238	0.0012 / ✓	0.0025	pCi/g	
			Pu-238 DL	0.0098 ✓		pCi/g	
			Pu-239	0.0137 / ✓	0.0028	pCi/g	
			Pu-239 DL	0.0064 ✓		pCi/g	
			Pu-242T Recovery	75.56		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200104346	300227103	3-OS	Count Time	3000.00		min	
			Efficiency	29.10		%	
200104347	300227108	5-US	Pu-238	0.0310 ✓	0.0034	pCi/g	
			Pu-238 DL	0.0057		pCi/g	
			Pu-239	0.0086 ✓	0.0018	pCi/g	
			Pu-239 DL	0.0026		pCi/g	
			Pu-242T Recovery	86.70		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.95		%	
200104348	300227113	7A-US	Pu-238	0.0002 ✓	0.0011	pCi/g	
			Pu-238 DL	0.0038		pCi/g	
			Pu-239	0.0060 ✓	0.0019	pCi/g	
			Pu-239 DL	0.0056		pCi/g	
			Pu-242T Recovery	79.53		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.40		%	
200104349	300227118	7B-US	Pu-238	0.0013 ✓	0.0009	pCi/g	
			Pu-238 DL	0.0016		pCi/g	
			Pu-239	0.0026 ✓	0.0012	pCi/g	
			Pu-239 DL	0.0041		pCi/g	
			Pu-242T Recovery	91.80		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104349	300227118	7B-US	Efficiency	32.59		%	
200104350	300227123	7C-OS	Pu-238	0.0003 ✓	0.0017	pCi/g	
			Pu-238 DL	0.0079		pCi/g	
			Pu-239	0.0126 ✓	0.0028	pCi/g	
			Pu-239 DL	0.0081		pCi/g	
			Pu-242T Recovery	76.59		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.29		%	
200104351	300227124	7C-US	Pu-238	0.0201 ✓	0.0027	pCi/g	
			Pu-238 DL	0.0029		pCi/g	
			Pu-239	0.0599 ✓	0.0048	pCi/g	
			Pu-239 DL	0.0038		pCi/g	
			Pu-242T Recovery	77.78		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.51		%	
200104352	300227133	4-OS	Pu-238	0.0004 ✓	0.0018	pCi/g	
			Pu-238 DL	0.0072 ✓		pCi/g	
			Pu-239	0.0229 ✓	0.0035	pCi/g	
			Pu-239 DL	0.0087		pCi/g	
			Pu-242T Recovery	67.24		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.73		%	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200104353	300227138	4-US	Pu-238	0.0025 ✓	0.0011	pCi/g	
			Pu-238 DL	0.0019		pCi/g	
			Pu-239	0.0114 ✓	0.0019	pCi/g	
			Pu-239 DL	0.0034		pCi/g	
			Pu-242T Recovery	105.38		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	28.97		%	
200104354	300227143	6B-US	Pu-238	0.0091 ✓	0.0019	pCi/g	
			Pu-238 DL	0.0037 ✓		pCi/g	
			Pu-239	0.1279 ✓	0.0072	pCi/g	
			Pu-239 DL	0.0050		pCi/g	
			Pu-242T Recovery	88.16		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.02		%	
200104355	300227148	6B-OS	Pu-238	0.0127 ✓	0.0024	pCi/g	
			Pu-238 DL	0.0038		pCi/g	
			Pu-239	0.1925 ✓	0.0102	pCi/g	
			Pu-239 DL	0.0061		pCi/g	
			Pu-242T Recovery	77.12		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	28.30		%	
200104356	300227153	1-US	Pu-238	0.0026 ✓	0.0020	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104356	300227153	1-US	Pu-238 DL	0.0084	0.0019	pCi/g	
			Pu-239	0.0052 ✓		pCi/g	
			Pu-239 DL	0.0052		pCi/g	
			Pu-242T Recovery	58.21		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	32.58		%	
			Pu-238	-0.0001 ✓	0.0022	pCi/g	
200104357	300227158	1-OS	Pu-238 DL	0.0090		pCi/g	
			Pu-239	0.0006 ✓		pCi/g	
			Pu-239 DL	0.0075		pCi/g	
			Pu-242T Recovery	50.58		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.32		%	
200104358	300227163	2-OS	Pu-238	-0.0007 ✓	0.0009	pCi/g	
			Pu-238 DL	0.0034		pCi/g	
			Pu-239	0.0019 ✓		pCi/g	
			Pu-239 DL	0.0085		pCi/g	
			Pu-242T Recovery	67.69		%	
			Analysis Date	17-DEC-1999		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.17 ✓		%	
200104359	300227168	2-US	Pu-238	-0.0023 ✓	0.0019	pCi/g	
			Pu-238 DL	0.0089		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104359	300227168	2-US	Pu-239	0.0054 ✓✓	0.0024	pCi/g	
			Pu-239 DL	0.0092		pCi/g	
			Pu-242T Recovery	85.34		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.53		%	
200104360	300227173	3B-OS	Pu-238	-0.0016 ✓✓	0.0016	pCi/g	
			Pu-238 DL	0.0061		pCi/g	
			Pu-239	0.0013 ✓✓	0.0016	pCi/g	
			Pu-239 DL	0.0062		pCi/g	
			Pu-242T Recovery	94.37		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.09		%	
200104361	300227178	3B-US	Pu-238	-0.0026 ✓✓	0.0015	pCi/g	
			Pu-238 DL	0.0078		pCi/g	
			Pu-239	0.0060 ✓✓	0.0019	pCi/g	
			Pu-239 DL	0.0034		pCi/g	
			Pu-242T Recovery	63.50		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.80		%	
200104362	300227179	8-OS	Pu-238	0.0005 ✓✓	0.0009	pCi/g	
			Pu-238 DL	0.0036		pCi/g	
			Pu-239	0.0033 ✓✓	0.0013	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

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13-Jan-2000 14:05

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104362	300227179	8-OS	Pu-239 DL	0.0043		pCi/g	
			Pu-242T Recovery	89.74		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	32.50		%	
200104363	300227188	8-US	Pu-238	-0.0006 ✓	0.0012	pCi/g	
			Pu-238 DL	0.0057 ✓		pCi/g	
			Pu-239	0.0013 ✓	0.0015	pCi/g	
			Pu-239 DL	0.0064		pCi/g	
			Pu-242T Recovery	101.98		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.33		%	
200104364	300227193	9-OS	Pu-238	0.0002 ✓	0.0008	pCi/g	
			Pu-238 DL	0.0028 ✓		pCi/g	
			Pu-239	0.0086 ✓	0.0019	pCi/g	
			Pu-239 DL	0.0036		pCi/g	
			Pu-242T Recovery	81.20		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.57 ✓		%	
200104365	300227198	9-US	Pu-238	-0.0012 ✓	0.0015	pCi/g	
			Pu-238 DL	0.0068 ✓		pCi/g	
			Pu-239	0.0120 ✓	0.0028	pCi/g	
			Pu-239 DL	0.0082		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104365	300227198	9-US	Pu-242T Recovery	70.44		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.87		%	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104361	300227178		Pu-238	-0.0026	0.0015	pCi/g	
			Pu-238 DL	0.0078		pCi/g	
			Pu-239	0.0060	0.0019	pCi/g	
			Pu-239 DL	0.0034		pCi/g	
			Pu-242T Recovery	63.50		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.80		%	
200118479	300251573	300227178	Pu-238	-0.0008	0.0008	pCi/g	
			Pu-238 DL	0.0034		pCi/g	
			Pu-239	0.0031	0.0015	pCi/g	
			Pu-239 DL	0.0052		pCi/g	
			Pu-242T Recovery	86.05		%	
			Analysis Date	05-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	

\*\*\*\* FINAL REPORT \*\*\*\*

019  
13-Jan-2000 14:05

Page 9 of 12

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200118479	300251573	300227178	Efficiency	31.35		%	

\*\*\*\* FINAL REPORT \*\*\*\*

020

13-Jan-2000 14:05

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200106489	300230721	Pu-238	4.6745	0.1460	pCi/g	4.8	0.17	pCi/g	IN CONTROL
		Pu-239	3.3538	0.1070	pCi/g	3.4	0.11	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.39798	300251572	Pu-238	4241	137	pCi/L	4180	418	pCi/L	IN CONTROL
00.39798	300251575	Pu-238	4298	144	pCi/L	4180	418	pCi/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22784	300251571	Pu-238	-0.0001	0.0025	pCi/g	0	0	pCi/g	IN CONTROL
		Pu-239	0.0006	0.0020	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

021  
13-Jan-2000 14:05

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Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22784	300251574	Pu-238	-0.0011	0.0020	pCi/g	0	0	pCi/g	IN CONTROL
		Pu-239	0.0009	0.0023	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

022  
13-Jan-2000 14:05

Page 12 of 1.

Method: PU RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

CEA  
Analyst

SL  
Review

CS  
Team Leader

NK for PCL  
QA Officer

1/13/00  
Date

1/14/00  
Date

1/14/00  
Date

01/14/00  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry:  
1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
**NATIONAL LABORATORY**  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Analytical Chemistry and Science  
Los Alamos, New Mexico 87545

To/MS: Files  
From/MS: Edward Gonzales/ MS K484  
Phone/FAX: 7-7094/5-5982  
Symbol: CST-9/99  
Date: March 4, 2000

This is a Case Narrative for the following:

**Submission ID: 100039363**  
**Analysis: Sr in Biologicals**

### **I. Introduction**

In August 1999, a set of samples was delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Strontium In Environmental Matrices – Liquid Scintillation Counting. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC367, R.1.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. All control perimeters were in control with the exception of the following out of range recoveries (200104349 112% and 200104359 46%). The recoveries are indicative of the complexity of the matrix analyzed and present a small bias to the data.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Edward R. Gonzales

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

11

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	000000M34A02106CA3	Due Date:	05-OCT-99
Requester Group:	ESH-20	Logged Date:	03-AUG-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	665-3147	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

*OK 5.0*

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104343	300227095	3-US	Sr-90	4.07 ✓	0.39	pCi/g	
			Sr-90 MDA	0.39		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104346	300227100	3-OS	Sr-90	6.33 ✓	0.49	pCi/g	
			Sr-90 MDA	0.35		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104347	300227105	5-US	Sr-90	4.37 ✓	0.41	pCi/g	
			Sr-90 MDA	0.41		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104348	300227110	7A-US	Sr-90	1.83 ✓	0.40	pCi/g	
			Sr-90 MDA	0.70		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104349	300227115	7B-US	Sr-90	1.03 ✓	0.18	pCi/g	
			Sr-90 MDA	0.28		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104350	300227120	7C-OS	Sr-90	6.73 ✓	0.50	pCi/g	
			Sr-90 MDA	0.32		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV Method Area: EH-ALPHA *ck 4/15/00* Submission Id : 100039363

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200104351	300227126	7C-US	Sr-90	6.39 / ✓	0.52	pCi/g	
			Sr-90 MDA	0.40		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104352	300227130	4-OS	Sr-90	22.14 / ✓	1.35	pCi/g	
			Sr-90 MDA	0.41		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104353	300227135	4-US	Sr-90	7.53 / ✓	0.61	pCi/g	
			Sr-90 MDA	0.47		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104354	300227140	6B-US	Sr-90	5.94 / ✓	0.48	pCi/g	
			Sr-90 MDA	0.38		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104355	300227145	6B-OS	Sr-90	7.49 / ✓	0.55	pCi/g	
			Sr-90 MDA	0.35		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104356	300227150	1-US	Sr-90	4.97 / ✓	0.44	pCi/g	
			Sr-90 MDA	0.39		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104357	300227155	1-OS	Sr-90	6.48 / ✓	0.49	pCi/g	
			Sr-90 MDA	0.33		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104358	300227160	2-OS	Sr-90	8.81 / ✓	0.64	pCi/g	
			Sr-90 MDA	0.40		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104359	300227165	2-US	Sr-90	5.09 / ✓	0.57	pCi/g	
			Sr-90 MDA	0.67		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104360	300227170	3B-OS	Sr-90	6.88 / ✓	0.51	pCi/g	
			Sr-90 MDA	0.33		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104361	300227175	3B-US	Sr-90	8.60 / ✓	0.66	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV Method Area: EH-ALPHA *Ch 5.81* Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104361	300227175	3B-US	Sr-90 MDA	0.46		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104362	300227181	8-OS	Sr-90	5.47 / ✓	0.44	pCi/g	
			Sr-90 MDA	0.34		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104363	300227185	8-US	Sr-90	2.51 / ✓	0.37	pCi/g	
			Sr-90 MDA	0.53		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104364	300227190	9-OS	Sr-90	9.13 / ✓	0.70	pCi/g	
			Sr-90 MDA	0.48		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200104365	300227195	9-US	Sr-90	3.47 / ✓	0.37	pCi/g	
			Sr-90 MDA	0.42		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	

## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104363	300227185		Sr-90	2.51	0.37	pCi/g	
			Sr-90 MDA	0.53		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	
200123211	300258934	300227185	Sr-90	1.87	0.30	pCi/g	
			Sr-90 MDA	0.45		pCi/g	
			Analysis Date	30-JAN-2000		DD-MON-YYYY	

\*\*\*\*\* FINAL REPORT \*\*\*\*\*

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200106491	300230719	Sr-90	1.25	0.54	pCi/g	1.66	0.053	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.36592	300258936	Sr-90	476.79	61.06	pCi/L	499.5	15.98	pCi/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22784	300258935	Sr-90	-0.31	0.18	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

Method: SR-90 LS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

Eref  
Analyst

PS  
Review

ES  
Team Leader

RL  
QA Officer

3/29/00  
Date

3/30/00  
Date

3/30/00  
Date

3/30/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

*To/MS:* M. Ebinger, Phil Fresquez/ MS M887  
*From/MS:* S. R. Garcia/ MS K484  
*Phone/FAX:* 5-0270/5-5982  
*Symbol:* CST-9-ME-99-3  
*Date:* October 26, 1999

This is a Case Narrative for the following:

**Submission ID** : 100039363  
**Analysis** : CS-137 ASSAY OF VEGETATION ASH FROM AREA G

### **I. Introduction**

On August 20, 1999 a set of vegetation ash samples were from area G delivered to the CST-9 radiochemistry section for the <sup>137</sup>Cs analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Gamma-Ray-Emitting Nuclides in Environmental Matrices - Gamma Spectroscopy, an Instrumental Method. The specific procedure can be found on line @ <http://cst.lanl.gov/docs>, Method ANC328, R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

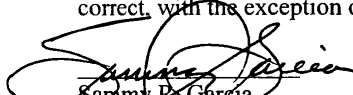
### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package.

The vegetation ash samples were picked up at Cage 7, Bldg. 1, TA-59. All open and blind QC's were within CST-9's statistical acceptance criteria. All gamma count times were standard at 30,000sec each.

Please feel free to call or email me if you have any questions concerning this submission.

I verify, to the best of my knowledge, that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Sammy R. Garcia  
Email: [garcia\\_s@lanl.gov](mailto:garcia_s@lanl.gov)

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Method: GENERIC GAMMA Method Area: EH-GAMMA Submission Id : 100039363

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	000000M34A02106CA3	Due Date:	05-OCT-99
Requester Group:	ESH-20	Logged Date:	03-AUG-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	665-3147	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200104343	300227096	3-US ✓	CS-137 ✓	0.000 ✓	0.382	pCi/g	
			CS-137 MDA	0.191		pCi/g	
200104346	300227101	3-OS ✓	CS-137 ✓	0.375 ✓	0.125	pCi/g	
			CS-137 MDA	0.356		pCi/g	
200104347	300227106	5-US ✓	CS-137 ✓	0.104 ✓	0.053	pCi/g	
			CS-137 MDA	0.165		pCi/g	
200104348	300227111	7A-US ✓	CS-137 ✓	0.000 ✓	0.385	pCi/g	
			CS-137 MDA	0.192		pCi/g	
200104349	300227116	7B-US ✓	CS-137 ✓	0.000 ✓	0.365	pCi/g	
			CS-137 MDA	0.182		pCi/g	
200104350	300227121	7C-OS ✓	CS-137 ✓	0.000 ✓	0.634	pCi/g	
			CS-137 MDA	0.317		pCi/g	
200104351	300227127	7C-US ✓	CS-137 ✓	0.000 ✓	0.486	pCi/g	
			CS-137 MDA	0.243 ✓		pCi/g	
200104352	300227131	4-OS ✓	CS-137 ✓	0.009 ✓	0.294	pCi/g	
			CS-137 MDA	0.147		pCi/g	
200104353	300227136	4-US ✓	CS-137 ✓	0.293 ✓	0.075	pCi/g	
			CS-137 MDA	0.206		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: **GENERIC GAMMA** Method Area: **EH-GAMMA** Submission Id : **100039363**

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104354	300227141	6B-US ✓	CS-137 ✓	0.000 ✓✓	0.505	pCi/g	
			CS-137 MDA	0.253 ✓✓		pCi/g	
200104355	300227146	6B-OS ✓	CS-137 ✓	0.029 ✓✓	0.440	pCi/g	
			CS-137 MDA	0.220 ✓✓		pCi/g	
200104356	300227151	1-US ✓	CS-137 ✓	0.033 ✓✓	0.423	pCi/g	
			CS-137 MDA	0.211 ✓✓		pCi/g	
200104357	300227156	1-OS ✓	CS-137 ✓	0.048 ✓✓	0.425	pCi/g	
			CS-137 MDA	0.213 ✓✓		pCi/g	
200104358	300227161	2-OS ✓	CS-137 ✓	0.015 ✓✓	0.380	pCi/g	
			CS-137 MDA	0.190 ✓✓		pCi/g	
200104359	300227166	2-US ✓	CS-137 ✓	0.000 ✓✓	0.502	pCi/g	
			CS-137 MDA	0.251 ✓✓		pCi/g	
200104360	300227171	3B-OS ✓	CS-137 ✓	0.014 ✓✓	0.350	pCi/g	
			CS-137 MDA	0.175 ✓✓		pCi/g	
200104361	300227176	3B-US ✓	CS-137 ✓	0.216 ✓✓	0.056	pCi/g	
			CS-137 MDA	0.153 ✓✓		pCi/g	
200104362	300227182	8-OS ✓	CS-137 ✓	0.000 ✓✓	0.629	pCi/g	
			CS-137 MDA	0.314 ✓✓		pCi/g	
200104363	300227186	8-US ✓	CS-137 ✓	0.000 ✓✓	0.572	pCi/g	
			CS-137 MDA	0.286 ✓✓		pCi/g	
200104364	300227191	9-OS ✓	CS-137 ✓	0.156 ✓✓	0.075	pCi/g	
			CS-137 MDA	0.234 ✓✓		pCi/g	
200104365	300227196	9-US ✓	CS-137 ✓	0.324 ✓✓	0.064	pCi/g	
			CS-137 MDA	0.151 ✓✓		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100039363

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200106558	300230787	CS-137	23.3	2.5	pCi/g	23.4	.77	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.33742	300241668	CS-137	28.2	3.0	pCi/g	30	1	pCi/g	IN CONTROL
00.33376	300241669	CS-137	5.05	0.54	pCi/g	5.0400	0.1700	pCi/g	IN CONTROL

## METHOD BLANK


<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22785	300241667	CS-137	0.000	0.021	pCi/g	0.0	0.0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

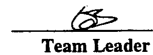
Method: GENERIC GAMMA

Method Area: EH-GAMMA

Submission Id : 100039363

  
Analyst

  
Review

  
Team Leader

  
QA Officer

10/26/99  
Date

10/27/99  
Date

10/28/99  
Date

10/29/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry: 1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Analytical Chemistry Sciences  
Los Alamos, New Mexico 87545

To/MS: Michael Ebinger ESH-20/M887  
From/MS: Claudine Armenta/K484  
Phone/FAX: 5-7358/5-5982  
Symbol: CST-9/00  
Date: February 3, 2000

This is a Case Narrative for the following:

**Submission ID** : 100039363  
**Analysis** : Am analysis on Biological Samples

### **I. Introduction**

On August 03, 1999 twenty-two biological samples were delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Americium In Environmental Matrices - Alpha Spectroscopy. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC372 R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

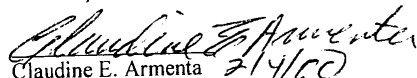
### **IV. Comments**

Twenty-two samples were analyzed for Americium-241. These samples are spiked with Americium-243.

All Quality Control parameters are within appropriate limits and as such meet CST-9's quality assurance program objectives.

There are two samples that were flagged with TRO these samples fell above the tracer recovery of 30%-110%. I believe that the spectrum is a little broad and it added in counts. This data was analyzed twice the second run B-05-00Am was analyzed at 1.0 gram and the best results of the two were reported. The other flagged (TRO) data is in error because they are above the 30% tracer recovery. One of my blank data fell Out of Control and this is due to the shift in the spectra and the hand calculations. Inserted is a E-mail from George Brooks and the quikalpha2.XLS program to calculate the tracer recovery and correct the results. The other data sets are B-36-99Am and B-38-99Am.

I verify, to the best of my knowledge that the listed results are both complete and technically correct, with the exception of the item(s) detailed above.

  
Claudine E. Armenta 2/4/00

010

03-Feb-2000 15:36

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

Page 1 of 10

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	000000M34A02106CA3	Due Date:	05-OCT-99
Requester Group:	ESH-20	Logged Date:	03-AUG-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	665-3147	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

CUSTOMER SAMPLES

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104343	300227097	3-US	Am-241	✓ 0.0031	0.0240	pCi/g	
			Am-241 DL	0.0122		pCi/g	
			Am-243T Recovery	96.76		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.08		%	
200104346	300227102	3-OS	Am-241	✓ 0.0340	0.0075	pCi/g	
			Am-241 DL	0.0243		pCi/g	
			Am-243T Recovery	67.94		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.08		%	
200104347	300227107	5-US	Am-241	✓ 0.0695	0.0065	pCi/g	
			Am-241 DL	0.0088		pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104347	300227107	5-US	Am-243T Recovery	102.41		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.00		%	
200104348	300227112	7A-US ✓	Am-241 ✓	0.0048 ✓	0.0020	pCi/g	
			Am-241 DL	0.0082		pCi/g	
			Am-243T Recovery	91.65		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.41		%	
200104349	300227117	7B-US ✓	Am-241 ✓	-0.0023 ✓	0.0029	pCi/g	
			Am-241 DL	0.0034		pCi/g	
			Am-243T Recovery	96.54		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	32.43		%	
200104350	300227122	7C-OS ✓	Am-241 ✓	0.0192 ✓	0.0033	pCi/g	
			Am-241 DL	0.0077		pCi/g	
			Am-243T Recovery	126.83		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	29.25		%	
200104351	300227128	7C-US ✓	Am-241 ✓	0.0243 ✓	0.0038	pCi/g	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104351	300227128	7C-US	Am-241 DL	0.0052		pCi/g	
			Am-243T Recovery	101.32		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.45		%	
200104352	300227132	4-OS	Am-241	0.1146	0.0090	pCi/g	
			Am-241 DL	0.0144		pCi/g	
			Am-243T Recovery	41.01		%	
			Analysis Date	12-JAN-2000		DD-MON-YYYY	
200104353	300227137	4-US	Am-241	0.0343	0.0044	pCi/g	
			Am-241 DL	0.0100		pCi/g	
			Am-243T Recovery	63.52		%	
			Analysis Date	12-JAN-2000		DD-MON-YYYY	
200104354	300227142	6B-US	Am-241	0.0711	0.0071	pCi/g	
			Am-241 DL	0.0098		pCi/g	
			Am-243T Recovery	85.66		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	30.74		%	
200104355	300227147	6B-OS	Am-241	0.2752	0.0131	pCi/g	
			Am-241 DL	0.0070		pCi/g	
			Am-243T Recovery	58.48		%	
			Analysis Date	12-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	28.30		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104356	300227152	1-US /	Am-241	0.0029 ✓	0.0014	pCi/g	
			Am-241 DL	0.0056		pCi/g	
			Am-243T Recovery	100.30		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.07		%	
200104357	300227157	1-OS /	Am-241	0.0078 ✓	0.0031	pCi/g	
			Am-241 DL	0.0136		pCi/g	
			Am-243T Recovery	32.16		%	
			Analysis Date	12-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	31.32		%	
200104358	300227162	2-OS L	Am-241	0.0146 ✓	0.0035	pCi/g	
			Am-241 DL	0.0084		pCi/g	
			Am-243T Recovery	34.49		%	
			Analysis Date	12-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	31.17 ✓		%	
200104359	300227167	2-US L	Am-241	0.0039	0.0026	pCi/g	
			Am-241 DL	0.0174		pCi/g	
			Am-243T Recovery	33.37		%	
			Analysis Date	08-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104359	300227167	2-US	Efficiency	31.53 ✓		%	
200104360	300227172	3B-OS	Am-241	-0.000 ✓	0.0002	pCi/g	
			Am-241 DL	0.0084		pCi/g	
			Am-243T Recovery	97.97		%	
			Analysis Date	08-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.09		%	
200104361	300227177	3B-US ✓	Am-241	-0.0044 ✓	0.0164	pCi/g	
			Am-241 DL	0.0153		pCi/g	
			Am-243T Recovery	64.32		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	29.81		%	
200104362	300227183	8-OS ✓	Am-241	-0.0016 ✓	0.0012	pCi/g	
			Am-241 DL	0.0028		pCi/g	
			Am-243T Recovery	58.22		%	
			Analysis Date	08-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	32.50		%	
200104363	300227187	8-US ✓	Am-241	0.0011 ✓	0.0006	pCi/g	
			Am-241 DL	0.0049		pCi/g	
			Am-243T Recovery	98.87		%	
			Analysis Date	08-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104363	300227187	8-US	Count Time	3000.00		min	
			Efficiency	29.33		%	
200104364	300227192	9-OS	Am-241	-0.0001	0.0004	pCi/g	
			Am-241 DL	0.0074		pCi/g	
			Am-243T Recovery	112.14		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	28.08		%	
200104365	300227197	9-US	Am-241	0.0035	0.0030	pCi/g	
			Am-241 DL	0.0235		pCi/g	
			Am-243T Recovery	42.00		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	TRO		NONE	
			Count Time	3000.00		min	
			Efficiency	32.74		%	

#### DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104361	300227177		Am-241	-0.0044	0.0164	pCi/g	
			Am-241 DL	0.0153		pCi/g	
			Am-243T Recovery	64.32		%	
			Analysis Date	29-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 10003936

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104361	300227177		Efficiency	29.81		%	
200120269	300254462	300227177	Am-241	0.0018	0.0007	pCi/g	
			Am-241 DL	0.0047		pCi/g	
			Am-243T Recovery	80.87		%	
			Analysis Date	08-JAN-2000		DD-MON-YYYY	
			Instrument	32 ALPHA		NONE	
			Problem Code	OK		NONE	
			Count Time	3000.00		min	
			Efficiency	31.35		%	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 10003936

## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200106489	300230722	Am-241	9.8845	0.2083	pCi/g	9.7	0.44	pCi/g	IN CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.41404	300254460	Am-241	0.0025	0.0001	pCi/L	0.0023	0.00023	pCi/L	IN CONTROL
00.41404	300254464	Am-241	0.0026	0.0001	pCi/L	0.0023	0.00023	pCi/L	IN CONTROL
00.41404	300254465	Am-241	0.0023	0.0001	pCi/L	0.0023	0.00023	pCi/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22784	300254461	Am-241	0.0134	0.0037	pCi/g	0	0	pCi/g	OUT OF CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result</u> <u>Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC</u> <u>Value</u>	<u>QC</u> <u>Uncertainty</u>	<u>QC</u> <u>units</u>	<u>QC</u> <u>Evaluation</u>
00.22784	300254463	Am-241	0.0063	0.0022	pCi/g	0	0	pCi/g	WARNING 2-3SIG
00.22784	300254466	Am-241	0.0000	0.0003	pCi/g	0	0	pCi/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

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Method: AM RAS ENV

Method Area: EH-ALPHA

Submission Id : 100039363

SEA  
Analyst

SLG  
Review

ES  
Team Leader

CRH  
QA Officer

2/3/00  
Date

2/7/00  
Date

2/7/00  
Date

2/7/2000  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry:  
1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

**Los Alamos**  
NATIONAL LABORATORY  
**Memorandum**  
*Chemical Science and Technology*  
*Responsible Chemistry for America*  
CST-9/Inorganic Trace Analysis  
Los Alamos, New Mexico 87545

To/MS: ESH-20/M887  
From/MS: Nancy Lujan/ MS K484  
Phone/FAX: 5-6010/5-5982  
Symbol: CST-9/9  
Date: November 5, 1999

This is a Case Narrative for the following:

**Submission ID** : 100039363  
**Analysis** : U (KPA) in Vegetation Ash

### **I. Introduction**

On August 20, 1999, a set of Vegetation Ash samples was delivered to the CST-9 radiochemistry section for the requested analysis.

### **II. Analytical Results/Methodology**

The analytical results are presented as indicated by the terms on the Analytical Service Agreement. Each set of data will include sample identification information, the analytical results, and other information as required by the customer.

The analysis requested is: Uranium in Environmental Matrices – KPA. The specific procedure can be found either on line @ <http://cst.lanl.gov/docs>, or in hardcopy form within the document entitled LA-10300-M, Vol. III, Method ANC337, R.0.

### **III. Quality Control**

The appropriate quality control samples were analyzed with the samples.

### **IV. Comments**

This case narrative was generated to document the circumstances that were involved with the development of this data package. As part of the process to inform our customers of potential problems associated with specific methods, the KPA method has been found to be unreliable in some matrices due to the strong susceptibility of interference's from constituents commonly found in environmental samples. Alternate techniques available for the analysis of U would be either ICP-MS or Isotopic Uranium analysis.

Sample Id 200106490 lists Out of Control. It is my opinion that this Out of Control may have been caused by some problems with the preparation of the sample. Since the Open QC and the Blank are in Control, it is my opinion that this does not reflect a problem in the quality of the remaining data.

The Replicate Error Ratio Determinations do not meet the requirements of the DOE-AL SOW on Sample Id 200104361. I believe that there was a variance in the matrix homogeneity in the samples that may have caused the replicate error. I verify, to the best of my knowledge, that the listed results are both complete and technically correct.

  
Nancy Lujan

100x 44

03-Nov-1999 14:59

LOS ALAMOS NATIONAL LABORATORY  
CST Analytical Chemistry  
Analytical Results Report

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4474011

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039363

Requester Name:	MICHAEL EBINGER	Customer Cost Code:	000000M34A02106CA3	Due Date:	05-OCT-99
Requester Group:	ESH-20	Logged Date:	03-AUG-1999	Screening Data:	NO SCREENING DATA REQUIRED
Mail Stop:	M887	Study:	ESH20 BIOLOGICALS	Logged by:	FERNANDEZ
Requester Phone:	665-3147	Analytical Service Agreement #:			
Requester Fax #:	667-0731				

## CUSTOMER SAMPLES

Sample Id	Task Id	Customer Id	Component	Result Value	Uncertainty	Units	Qualifier
200104343	300227094	3-US ✓	U ✓	0.91 ✓✓	0.09	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104346	300227099	3-OS ✓	U ✓	2.39 ✓✓	0.24	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104347	300227104	5-US ✓	U ✓	0.76 ✓✓	0.08	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104348	300227109	7A-US ✓	U ✓	1.08 ✓✓	0.11	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104349	300227114	7B-US ✓	U ✓	0.60 ✓✓	0.06	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104350	300227119	7C-OS ✓	U ✓	1.55 ✓✓	0.16	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104351	300227125	7C-US ✓	U ✓	1.01 ✓✓	0.10	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104352	300227129	4-OS ✓	U ✓	1.22 ✓✓	0.12	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	
200104353	300227134	4-US ✓	U ✓	0.14 ✓✓	0.01	ug/g	
			Analysis Date	28-OCT-1999 ✓		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039363

<u>Sample Id</u>	<u>Task Id</u>	<u>Customer Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104354	300227139	6B-US ✓	U ✓	1.24 ✓	0.12	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104355	300227144	6B-OS ✓	U ✓	0.82 ✓	0.08	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104356	300227149	1-US ✓	U ✓	0.82 ✓	0.08	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104357	300227154	1-OS ✓	U ✓	0.73 ✓	0.07	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104358	300227159	2-OS ✓	U ✓	0.88 ✓	0.09	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104359	300227164	2-US ✓	U ✓	1.46 ✓	0.15	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104360	300227169	3B-OS ✓	U ✓	0.56 ✓	0.06	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104361	300227174	3B-US ✓	U ✓	2.04 ✓	0.20	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104362	300227180	8-OS ✓	U ✓	0.71 ✓	0.07	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104363	300227184	8-US ✓	U ✓	0.73 ✓	0.07	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104364	300227189	9-OS ✓	U ✓	0.52 ✓	0.05	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200104365	300227194	9-US ✓	U ✓	1.94 ✓	0.19	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039363

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## DUPLICATE TASKS

<u>Sample Id</u>	<u>Task Id</u>	<u>Original Task</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>Qualifier</u>
200104361	300227174		U	2.04	0.20	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	
200113308	300242729	300227174	U	0.98	0.10	ug/g	
			Analysis Date	28-OCT-1999		DD-MON-YYYY	

\*\*\*\* FINAL REPORT \*\*\*\*

Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039363

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## \*\*\*\*\* CST QUALITY ASSURANCE REPORT \*\*\*\*\*

## BLIND QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
200106490	300230720	U	0.96	0.10	ug/g	0.47	0.047	ug/g	OUT OF CONTROL

## OPEN QC

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.38058	300242728	U	10.62	1.06	ug/L	10.1	1.0	ug/L	IN CONTROL

## METHOD BLANK

<u>Customer Id</u>	<u>Task Id</u>	<u>Component</u>	<u>Result Value</u>	<u>Uncertainty</u>	<u>Units</u>	<u>QC Value</u>	<u>QC Uncertainty</u>	<u>QC units</u>	<u>QC Evaluation</u>
00.22776	300242730	U	0.00	0.01	ug/g	0	0	ug/g	IN CONTROL

\*\*\*\* FINAL REPORT \*\*\*\*

03-Nov-1999 14:59

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Method: GENERIC KPA

Method Area: EH-ALPHA

Submission Id : 100039363

150444

ml  
Analyst

ES  
Review  
for SA

ES  
Team Leader

AG  
QA Officer

11/3/99  
Date

11/12/99  
Date

11/12/99  
Date

11/12/99  
Date

The control status of the preceeding data was evaluated using the standard statistical criteria set forth in Quality Assurance for Health and Environmental Chemistry:  
1992, LA-12790-MS, Vol I, pp. 19-29.

"The reported uncertainties are at the 1 sigma confidence level unless otherwise stated."

\*\*\*\* FINAL REPORT \*\*\*\*

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

Soils and Foodstuffs (7C20-1116G) M34A/02106/C43

P.I.# (505) 667-0815

ESH-20 MS M887

[illegible]

Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

# CHAIN-OF-CUSTODY RECORD

Soils and Foodstuffs ~~7C20 WEGG~~ <sup>M34A/02106/CA3</sup>

P.I.# (505) 667-0815

ESII-20 MS M887

Project Name		Request the following analysis:		number of containers	Sample Location/Remarks
Date	Time	Sample Name/Number			
Area 6 Vegetation		3H			
7/7/99		9:30	3-US		Site #3, understory, east of active pits inside fence.
		9:30	3-OS		Site #3, overstory (Pitum), east of active pits
		10:00	5-US		TRU Waste Pad #2
		10:30	7a-US		South of Pits 17+18, south of Bldg. 54-375
		10:45	7b-US		Pit 6 north of fence.
7/9/99		9:40	7c-OS		Outside fence, north of Bldg. 54-375
		9:40	7c-US		Outside fence, north of Bldg. 54-375
		10:20	4-OS		Outside fence, north of TRU Pad #2
		10:20	4-US		Outside fence, north of TRU Pad #2
		10:45	6b-US		outside fence, east of TRU pads, on mesa
		10:45	6b-OS		outside fence, east of TRU pads, on mesa
		2:15	1-US		Outside fence, south of tritium shaft
		2:15	1-OS		outside fence, south of tritium shaft
Relinquished by: (signature)		Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time
[Signature]		7-19-99/2:42pm	[Signature]		
Relinquished by: (signature)		Date/Time	Received by: (signature)	Relinquished by: (signature)	Date/Time
Relinquished by: (signature)		Date/Time	Received for Lab. by: (signature)	Date/Time	Remarks:

# Los Alamos

Soils and Foodstuffs (~~7C20~~<sup>W6</sup> ~~WE6G~~) 7434/02106/CA3  
B.L.H. (505) 667 0815

ESH-20 MS M887

[illegible]

# Los Alamos

Los Alamos National Laboratory  
Los Alamos, New Mexico 87545

## CHAIN-OF-CUSTODY RECORD

Soils and Foodstuffs ~~7C20~~ <sup>M34A/02106/CA3</sup> WE60

P.L.# (505) 667-0815

ESII-20 MS M887

Project Name <b>Area 6 Vegetation</b>		Request the following analysis: <b><math>^{238}\text{Pu}</math>, <math>^{239}\text{Pu}</math>, Total U, <math>^{90}\text{Sr}</math>, <math>^{137}\text{Cs}</math>, <math>^{241}\text{Am}</math></b>		S E C U R I T Y C O N T R O L S	Sample Location/Remarks
Sample (signature) <i>William R. Manning</i>					
Date	Time	Sample Name/Number			
7/7/99	9:30	3-US			Site #3 understorey, east of active pits inside fence
	9:30	3-OS			Site #3, overstorey (Pine), east of active pits
	10:00	5-US			TRU Waste Pad #2
	10:30	7a-US			South of Pits 17+18, south of Bldg. 54-375
	10:45	7b-US			Pit 6 north of berm.
7/8/99	9:40	7c-OS			Outside fence, north of Bldg. 54-375
	9:40	7c-US			Outside fence, north of Bldg. 54-375
	10:20	4-OS			Outside fence, north of TRU Pad #2
	10:20	4-US			Outside fence, north of TRU Pad #2
	10:45	6b-US			Outside fence, east of TRU pads, on mesa
	10:45	6b-OS			Outside fence, east of TRU pads, on mesa
	2:15	1-US			Outside fence, south of tritium shaft
	2:15	1-OS			Outside fence, south of tritium shaft
Relinquished by: (signature) <i>William R. Manning</i>		Date/Time 8-2-99/10:30am		Received by: (signature) <i>[Signature]</i>	
Relinquished by: (signature)		Date/Time		Received by: (signature)	
Relinquished by: (signature)		Date/Time		Received by: (signature)	
Relinquished by: (signature)		Date/Time		Received for Lab. by: (signature)	
Date/Time		Date/Time		Remarks:	

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